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CAUSES AND CONSEQUENCES OF DRUG ABUSE: A COMPARISON BETWEEN SYNTHETIC DRUG AND HEROIN USERS IN URBAN CHINA

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Abstract

This article examined the differences in causes and health consequences between synthetic drug and heroin abuse in urban China. Two-group comparisons were conducted to quantify differences in individual characteristics, causes of drug use, and HIV/STI risky sexual behavior between synthetic drug and heroin users; logistic regressions were employed to assess the net effect of synthetic drug use on risky sexual behavior. Results revealed that causes of synthetic drug use differed from those of heroin use; a combination of the knowledge gap concerning the harmful impact of synthetic drugs and the lesser punishment for their use appeared a main reason behind the shift from heroin to synthetic drugs; and synthetic drug use was a significant and powerful risk factor for HIV/STI risky sexual behavior. Educational and behavioral interventions are urgently needed to prevent the initiation of synthetic drug use among users to reduce their HIV/STI risky sexual behavior.

Keywords

causes and consequences of drug abuse; synthetic drug; heroin; HIV/STI risk behavior; China

Drug abuse as a widespread social and health problem in China dated back to the late 18th century (Lu, Fang, & Wang, 2008; Tang, Zhao, Zhao, & Cubells, 2006). By the early 20th century, China was home to more than 85% of opium addicts worldwide and the world's largest opium producer (United Nations Office on Drugs and Crime [UNODC], 2008). Widespread opium abuse continued in China until the establishment of the People's Republic in 1949. The government launched a series of nationwide campaigns in the early 1950s to fight against the demon of opium (Lowinger, 1977), which rid China free of illicit drugs for the next three decades.

Since the 1980s, however, the government's ability to control illicit drugs in China has been compromised amid profound social and economic changes unleashed by the open-door policy and the ensuing market transition (Lu et al., 2008; Yang, 2006). A combination of

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increasing urbanization and residential mobility, growing respect for individual rights and privacy, and widespread corruption has greatly undermined the traditional values and the effectiveness of social control over individual behavior (Wang, 2004; Yang, 2000; Yang & Luo, 2009). Not surprisingly, China has seen a resurgence of drug abuse. The resurface of illicit drugs, mainly opium and heroin, started in the remote rural areas and among ethnic minority populations but quickly evolved into a nationwide epidemic; smoking of drugs was soon replaced by injection drug use (Lai et al., 2000; Lu et al., 2008; Qian, Schumacher, Chen, & Ruan, 2006; Zheng et al., 1994). More recently, there has been a dramatic increase in the abuse of various synthetic drugs (Fang, Wang, Shi, Liu, & Lu, 2006), which are broadly defined as chemical compounds produced in a laboratory using chemicals rather than natural ingredients (Xia & Yang, 2017). While the list of synthetic drugs considered illicit (if used for nonmedical reasons) in China is long, the most common includes methamphetamine *(Bingdu),* ketamine (K *fen),* and ecstasy/MDMA *(Yaotou Wan),* which are quickly replacing heroin to become the most prevalent drugs abused in urban China (Fang et al., 2006; Han, 2007; Li, Zhang, & Liu, 2008; National Narcotics Control Commission [NNCC], 2012; Wang & Liu, 2007; Xia & Yang, 2017). In this article, synthetic drugs are defined as any illicit drugs on the list of banned drugs other than heroin.

Unlike that of heroin, the abuse of synthetic drugs is believed to stimulate sexual activity, contribute to unsafe sex, and increase the risk of sexually acquiring and/or transmitting HIV and other sexually transmitted infections (STIs; Bao et al., 2015; Colfax & Guzman, 2006; Liao et al., 2014; Xu et al., 2014). This may help explain that unsafe sex has taken over injection drug use to become the dominant route of HIV transmission in China. Sexual transmission of HIV is projected to be the decisive factor in the future course of the HIV epidemic in China (Merli, Hertog, Wang, & Li, 2006).

Despite the emerging synthetic drug epidemic and the often-assumed increased sexual risk of HIV/STIs from the abuse of synthetic drugs, we know very little of what may have caused the shift in the main drugs of abuse in China, and little empirical research has directly compared sexual risk behavior between heroin and synthetic drug users while controlling for potentially confounding factors. This article attempts to address this research gap. Using survey data from samples of synthetic drug and heroin users in Shanghai, we will examine differences in causes and sexual risk behavior between synthetic drug and heroin users. To the extent possible, qualitative data from the formative research phase of an on-going survey research will be used to supplement the survey data.

BACKGROUND

THEORETICAL PERSPECTIVES ON DRUG USE

Research to understand why some people abuse drugs while others do not has generated several theoretical perspectives on the social and behavioral causes of drug abuse (Payne & Gainey, 2005). However, the literature is generally silent on any potential differences between synthetic drug and heroin use. We will compare causes of synthetic drug and heroin use on three broader perspectives.

Social Control and Drug Use.—The basic premise of social control theory (Black, 1984; Gibbs, 1982; Hirschi, 1969) is that we are born with the tendency to pursue pleasure, which is tempered by formal and normative structures that shape behavior (Coser, 1982; Nagasawa, Qian, & Wong, 2000). As use of drugs could be pleasurable, individuals may be inclined towards drug use, but avoid it for fear of social sanctions. Ultimately, individuals' perception of the likelihood/severity of social sanctions (felt social control) and their attitudes about possible social sanctions will determine the likelihood of drug use. Subjective evaluation of the likelihood and severity of social sanctions is influenced by social bonds, which are embedded in people's attachment to others, commitment to institutions, involvement in normal activities, and beliefs in social norms/rules (Hirschi, 1969). The stronger such social bonds are, the stronger the felt social control, and consequently the less likely that individuals will indulge in drugs.

Social Learning and Drug Use.—Social learning theory emphasizes social influences of behavior and argues that drug use is not inborn but socially learned (Akers, 1985, 1998). Such social learning occurs through differential association, imitation, and differential reinforcement. An important risk factor for drug use is the presence of drug users in one's social networks (Bahr, Hoffmann, & Yang, 2005; Buchana & Latkin, 2008). Other things being equal, the more drug users there are in the network, the more likely that the individual will learn the same behavior.

Sensation Seeking and Drug Use.—While social control and social learning focus on interpersonal factors as moderators or facilitators of individual behavior, sensation seeking perspective emphasizes intrapersonal traits as contributing factors of drug abuse (Newcomb & Earleywine, 1996). Instead of looking to external forces, it emphasizes factors within individuals. Sensation seeking is a set of personality traits characterized by a drive for novel and complex thrills and willingness to take risks to seek sensations/thrills (Roberti, 2004; Yanovitzky, 2006; Zuckerman, 1994). As drug use could be pleasurable and socially risky, and generates a sense of thrill (Wood, Cochran, Pfefferbaum, & Arneklev, 1995), it is linked to individuals' level of sensation seeking. The higher the level of sensation seeking, the more likely individuals will seek the thrill of drugs.

SYNTHETIC DRUG USE AND RISKY SEXUAL BEHAVIOR

There is compelling evidence that methamphetamine (MA) use stimulates sexual activity (Corsi & Booth, 2008; Green, 2003; Kurtz, 2005; Zule, Costenbader, Meyer, & Wechsberg, 2007). In fact, a major reason to use MA may be to enhance sexual ability (Diaz, Heckert, & Sánchez, 2005). Use of MA is associated with the release of neurotransmitters in the brain, which increases sexual desire and reduces sexual inhibitions (Anglin, Burke, Perrochet, Stamper, & Dawud-Noursi, 2000; Halkitis, Fischgrund, & Parsons, 2005), leading to an increased number of partners and amount/duration of sex (Drumright, Patterson, & Strathdee, 2006). It also may lead to deficits in impulse control and impaired decision-making, causing users to prefer immediate reward at the expense of severe future consequences (Hanson, Luciana, & Sullwold, 2008; Homer, Solomon, Moeller, Mascia, DeRaleau, & Halkitis, 2008; Verdejo-Garcia, Pérez-Garcia, & Bechara, 2006). Increased

sexual impulsivity can in turn lead to unsafe sex (Semple, Zians, Grant, & Patterson, 2005, 2006).

Likewise, ecstasy is believed to increase the release of serotonin and block serotonin re-uptake (Freese, Miotto, & Reback, 2002; Uys & Niesink, 2005). Its use is associated with feelings of sensuality, emotional closeness, sexual arousal, and reduced sexual inhibitions. Use of ecstasy is also linked to high level of impulsivity and impaired decision-making and in turn risky sex (Butler & Montgomery, 2004; Morgan, Impallomeni, Pirona, & Rogers, 2006; Schilder, Lampinen, Miller, & Hogg, 2005; Stephens, Holliday, & Jarboe, 2015).

The use of ketamine is associated with mental distortion, loss of memory, and muscle control (Drumright et al., 2006). Ketamine acts at the *N*-methyl-D-aspartate receptor to affect the neurochemistry of behavior and sensory information (Colfax & Guzman, 2006; Freese et al., 2002). Its use produces strong hallucinogenic and euphoric effects; users may experience mood elevation, amnesia, cognitive impairment, perception distortion, and a state of sedation. Because of its mind/body-altering effects, ketamine has been dubbed a rape drug. Its use has been associated with unprotected sex (Drumright et al., 2006; Smith, Larive, & Romanelli, 2002). Decreased sensation of pain also may lead to more traumatic sex that increases tissue damage and blood/semen contact (Drumright et al., 2006).

Polydrug use, highly prevalent among synthetic drug users (Halkitis & Palamar, 2008; Halkitis, Palamar, & Mukherjee, 2007; O'Grady, Arria, Fitzelle, & Wish, 2008), can further intensify the effects of drugs and increase risky sexual behavior and other adverse health consequences (Hirshfield, Schrimshaw, Stall, Margolis, Downing, & Chiasson, 2015; Parsons, Grov, & Golub, 2012; Stall et al., 2003; Yu, Wall, Chiasson, & Hirshfield, 2015). Studies indicate that polydrug use is preferred by users to achieve a desired high (Uys & Niesink, 2005). The interaction of the stimulant and depressive effects of different drugs may help achieve a high that is more intense and enjoyable and lasts longer than that of any single drug. Polydrug use also is associated with high levels of impulsivity and in turn unsafe sex (Butler & Montgomery, 2004; Parsons et al., 2012; Semple et al., 2005).

In addition to the pharmacological impact of synthetic drugs, the group or venue settings, which are more likely to be associated with synthetic drug use, are also believed to be conducive to risky sexual behaviors (Laidler, 2005; Maxwell, 2005). Evidence suggests that synthetic drug use is more prevalent in entertainment venues, such as dance clubs and discos, or social group gatherings in China (Xia & Yang, 2008) and worldwide (Calafat, Gómez, Juan, & Becoña, 2007; Mattison, Ross, Wolfson, Franklin, & HNRC Group, 2001; Parks & Kennedy, 2004), which is found to foster frequent polydrug use (Fendrich, Wislar, Johnson, & Hubbell, 2003; Klitzman, 2006; Lankenau & Clatts, 2005; Operario et al., 2006) and an increase in sexual partners and the likelihood of group sex (Fendrich et al., 2003; Zule et al., 2007). The environment of many entertainment venues, such as hot temperatures, loud music, and overcrowding, can further intensify the stimulating effect of synthetic drugs (Calafat, Juan, Becoña, Mantecón, & Ramón, 2009; Parrott, 2004).

DATA AND METHODS

This article is a secondary data analysis of two pre-existing companion surveys of synthetic drug and heroin users. The surveys were conducted in 2006 and 2007 in Shanghai using one-to-one private and confidential questionnaires and in-depth interviews by trained interviewers. The main purpose of the surveys was to collect empirical data to better understand the patterns and trends of drug abuse in Shanghai (Xia & Yang, 2017). Research protocols were reviewed and approved by the Research and Academic Integrity Committee (equivalent to an institutional review board in the United States) at the Shanghai Academy of Social Sciences for the protection of human subjects in research with a focus on protection of participants' drug use status and their otherwise entitled benefits in community and particularly in an institutional setting (detention or treatment/rehab facility).

Because synthetic drug and heroin users were subject to different legal punishments, they were sampled separately from different sources. Details of the surveys have been described elsewhere (Yang & Xia, 2010; Xia & Yang, 2017). Briefly, synthetic drug users were sampled from those who were administratively detained *(Zian Juliu* or detained for violating government ordinances) or receiving compulsive drug treatment and rehabilitation. The interviewers consisted of researchers, research assistants, and graduate students from the Shanghai Academy of Social Sciences and/or the Shanghai Center for Drug Reaction Surveillance *(Shanghai Yaopin Buliang Fanying Jiance Zhongxin).* All the interviewers had sociology, pharmacology, or public health education background; they were further trained in protection of human subjects in research, emphasizing voluntary participation and no harm to their well-being in an institutional environment. During the field work, the trained interviewers randomly visited the police stations and compulsive drug treatment centers around the city when new detainees were brought in. Heroin users were randomly sampled from the rosters of the city's compulsory rehab facilities.

For both samples, the trained interviewers approached each detainee and invited him/her for a 30-minute private and face-to-face interview in a private room without the presence of any staff members from the detention/rehab center. The interviewer first checked for eligibility. To be eligible, the potential participant must be a synthetic drug or heroin user, aged 18 and over, and able to give informed consent to participate in the study. The interviewers then explained to the eligible participants the purpose of the study and informed them that the interview would be one-to-one in a private room between him/her and the interviewer only. They were also informed of potential risks, including discomfort when asked personal questions about drugs and sexual behavior by a stranger and potential breach of confidentiality by the interviewer, and their rights to refuse to participate or to answer any specific questions. Potential participants were assured of confidentiality and shown that the questionnaire contained no name or any other identifying information; they were further assured that the data collected would not be shared with the detention/rehab center and would not affect their otherwise entitled benefits and rights in the center. Verbal consent was obtained from 730 synthetic drug users and 705 heroin users, who subsequently completed the private face-to-face interview.

In addition to the quantitative survey data, whenever possible, qualitative information from the key informant in-depth interviews and focus groups in the formative phase of an ongoing research project in China (hereafter "qualitative data") will be used in the analysis to supplement the survey data in discussion and interpretation of the findings.

The two samples will be merged for use in data analysis; answers to the survey question of "what drugs you often use," which allowed the respondents to report all drugs they used, will be used to classify respondents as synthetic drug or heroin users. A synthetic drug user is a respondent who answered to have used any drugs other than heroin. Few heroin users were polydrug users, but many synthetic drug users reported to have used more than one synthetic drug. Differences between single and polydrug users have been examined elsewhere (Yang & Xia, 2010). This paper will focus on comparison between synthetic drug and heroin users.

Data analysis will use STATA version 12 (StataCorp, 2011) and proceed in two parts. The first part will focus on bivariate comparisons between synthetic drug and heroin users in sociodemographic characteristics, drug use settings, post-use physiological and psychological characteristics, self-reported reasons for using the drug, and risky sexual behaviors. For categorical variables, Pearson's chi-squared test of independence in crosstabulation will be used; for ratio variables, Wald's F test of equality of means between two-groups after mean estimation will be employed (StataCorp, 2011). The results will provide bivariate tests if synthetic drug users differ significantly from heroin users in both individual characteristics and causes and consequences of their drug use. In the second part of data analysis, we will use logistic regression to further assess the net effect of type of drug used and drug use setting on risky sexual behaviors.

MEASURES

All measures were based on self-reports; most are self-descriptive and need no further explanation. For causes of drug use, three composite index variables were created to represent the three broader theoretical perspectives. Whenever feasible, additional variables were used to supplement the index variables. For perceived social control, we used as a proxy personal experience or involvement in events/behaviors indicating disrespect for social norms and rules; respondents reported (1 for yes and 2 for no) on nine events/behaviors (e.g., fighting in public; riding bus without a ticket). Answers were summed across the nine events to form a social control composite index. Ranging in value from 9 to 18, the higher the index value, the lesser the likelihood that the respondent had personal experience/involvement in any of the nine events, indicating stronger perceived social control. Cronbach's alpha is 0.71 for the index variable. The index variable will be supplemented with self-report of relationship to parents and agree/disagree with statements reflecting commitment to institutions (going to school is useless and work to earn a living is boring), beliefs in social norms/rules (life does not have to be serious and one cannot always follow rules), and the extent of involvement in normal activities (feelings of aimless and empty/boredom in life and the need to find things to do to release extra energy).

For social influence, the index variable was based on respondents' answers on a five-point scale (1 for strongly disagree to 5 for strongly agree) on nine statements (e.g., I always try to copy my friends; I often spend my leisure time with friends). The answers were summed across the nine statements to form the composite index. Ranging in value from 9 to 45, the higher the index, the more the respondent was potentially amenable to peer influences. Cronbach's alpha is 0.71 for the social influence index variable. The index variable will be supplemented with two dichotomous variables: having drug-using friends before own use and reporting peer, family, or environmental influences as reasons for drug use.

For sensation-seeking, the index variable was formed using respondents' answers (1 for disagree and 2 for agree) on eight statements (e.g., my life is OK but lacks excitement, and I like to play something new and thrill). The eight 1/2 answers were summed to create the sensation-seeking index. Ranging in value from 8 to 16, the higher the index, the stronger the sensation-seeking tendency the respondent had. Cronbach's alpha is 0.73 for the index variable. In addition, self-reporting satisfying curiosity and seeking pleasure/excitement as reasons for drug use will be used to supplement the index variable and to capture directly sensation seeking as the cause of drug use.

For consequences of drug use, three dichotomous variables were used to measure percentage of self-reporting post-use physiological dependence, psychological dependence, and destructive behavior. Risky sexual behavior was measured by (1) ever having unprotected sex with a non-stable partner, which includes anyone other than spouse; (2) having unprotected sex with a non-stable partner in the past 30 days; (3) having unprotected sex with a non-stable partner in the past three sexual intercourses, and (4) ever having group sex following use of the drug. In addition, incidence of STIs after starting drug use will be used as a proxy for post-drug use during unprotected sex to supplement the four direct measures of unprotected sex.

RESULTS

Of the list of 107 government-banned drugs at the time of the surveys, methamphetamine, ketamine, and ecstasy stood out as the main drugs used in Shanghai; a majority (95.9%) of synthetic drug users in our sample used one or more of the three main synthetic drugs. On average, synthetic drug users were younger (32.6 vs. 35.3 years old), better educated (43.3% vs. 36.9% having high school or more education), and less likely to be migrants (23.0% vs. 31.8%) than heroin users; they did not significantly differ from heroin users in gender composition, marital status, or employment status (Table 1). Compared to heroin users, synthetic drug users started using drugs at older ages (30.1 vs. 27.4 years old) and averaged much shorter duration (2.5 vs. 7.9 years) since first use with the drugs. Synthetic drug users were significantly more likely to be polydrug users (44.5% vs. 5.3%) and use drugs in entertainment venues than heroin users (65.1% vs. 11.6%); they were significantly more likely to describe feelings of agitation, including sexual arousal, but less likely to report feelings of calm, comfort, and sleepiness following use of drug.

In terms of likely causes for their drug use (Table 2), synthetic drug users scored higher on the social control index measure (16.0 vs. 15.6) than heroin users, indicating that synthetic

drug users had experienced fewer events of disrespect of social norms and rules than heroin users. However, none of the other measures of social control failed to separate synthetic drug users from heroin users. While synthetic drug users were less likely than heroin users to self-report peer, family, or environmental influences as reasons for using drugs, they appeared to have been subjected to greater social influence than heroin users. Not only were synthetic drug users more likely to report having drug-using friends before their own use, among those who had drug-using friends synthetic drug users had more drug-using friends than heroin users (2.6 vs. 0.8). With respect to tendency of sensation seeking, neither measure showed a statistically significant difference between synthetic drug and heroin users (Table 2).

As Table 3 reveals, synthetic drug users self-reported significantly less post drug-use feelings of dependence than heroin users (11.8% vs. 75.9% felt physiological dependence and 35.2% vs. 85.7% psychological dependence). However, they did not differ significantly from heroin users in any destructive behavior following the use of drugs. In terms of risky sexual behavior, all five measures indicated significant differences between synthetic drug users and heroin users. Compared to heroin users, synthetic drug users were more likely to have unprotected sex with a non-stable partner in their lifetime (54.1% vs. 34.6%), in the 30 days prior to the interview (43.0% vs. 23.3%), and in the past three sexual intercourses (22.6% vs. 13.6%). Synthetic drug users were also significantly more likely to ever have group sex following drug use than heroin users (11.0% vs. 3.5%). In contrast to the four direct measures, all of which point to a riskier sexual life among synthetic drug users, the indirect measure of unprotected sex (self-report of any STIs since started using drugs) revealed that fewer synthetic drug users than heroin users (3.8% vs. 7.2%) reported STIs, suggesting indirectly a safer sexual life among synthetic drug users than heroin users.

Table 4 shows the logistic regression analysis of synthetic drug use as a risk factor of unprotected sex with a non-stable partner. For the lifetime measure and before controlling for drug-use related characteristics (Model 1), synthetic drug use was a significant risk factor. With sociodemographic characteristics and causes of drug use controlled for in the model, synthetic drug use more than doubled the odds ratio (OR = 2.39) of ever having unprotected sex with a non-stable partner (USWNP). Being male and young were associated with significantly higher and lower odds, respectively, of lifetime USWNP. All three composite measures of causes of drug use were also significantly associated with lifetime USWNP. Other things being equal, individuals with greater felt social control were associated with lower odds (OR = 0.82) while those who were more susceptible to social influence and who reported a greater sensation seeking trait were associated with significantly higher odds of lifetime USWNP.

When the four drug-use related characteristics were controlled for in Model 2, synthetic drug use remained a significant risk factor for lifetime USWNP, although the strength of the association was somewhat reduced (OR down from 2.39 to 2.09). Of the drug-use related characteristics, polydrug use and group sex after using drugs were significantly associated with increased odds of lifetime USWNP. The association between group sex and lifetime USWNP was particularly strong, more than doubling the odds ratios (2.16). Using drugs in a venue setting was, however, not associated with ever having USWNP. Sociodemographically, being male remained a risk factor while age ceased to be a risk

factor. In addition, being currently married now became a significant protective factor, associated with a decreased odds of life-time USWNP. All three measures of causes of drug use remained significant factors in understanding lifetime USWNP in Model 2.

For the 30-day measure of risky sex, synthetic drug use was again associated with more than doubling the odds of unprotected sex with a non-stable partner, with (Model 2) or without (Model 1) controlling for the drug-use related characteristics. Sociodemographically, being male ceased to be a significant risk factor of USWNP in the 30 days prior to the interview while being currently married and having high school or more education became significantly associated with lower odds of USWNP in both models. Of the three composite measures of causes of drug use, social influence ceased to be associated with the odds of USWNP in the 30 days prior to the interview. Like the patterns for the lifetime risky sex measure, felt social control was associated with significantly lower odds while sensation seeking trait was associated with significantly higher odds of USWNP.

Finally, when the analysis was limited to the past three sexual intercourses, synthetic drug use was again associated with significantly higher odds of USWNP when the drug-use related characteristics were not controlled for (OR = 1.93, Model 1). When they were controlled for in Model 2, synthetic drug-use was associated with increased odds of USWNP only at the 10% significance level. Polydrug use was, too, associated with USWNP only at the 10% level. Having group sex after using drugs turned out to be a strong risk factor, more than quadrupling the odds (OR = 4.23) of any USWNP in the past three sexual intercourses. Sociodemographically, being male was the only significant risk factor, more than tripling the odds of USWNP in both Model 1 (OR = 3.74) and Model 2 (OR = 3.51).

CONCLUSIONS AND DISCUSSION

Despite the rapidly evolving synthetic drug epidemic and its potential association with increased sexual transmission of HIV and other STIs in China, we know no empirical research into what may have caused the shift in the main drugs of abuse and if synthetic drug use is indeed associated with increased HIV/STI risky sexual behavior. Using data from two identical surveys of synthetic drug and heroin users in Shanghai, we first quantified individual differences in sociodemographic characteristics, causes of drug abuse, and post drug-use unprotected sex with a non-stable partner between synthetic drug and heroin users. We then focused on synthetic drug use as a potential contributing factor of HIV/STI risky sexual behavior while controlling for differences in sociodemographic characteristics, causes of drug abuse, and drug-use related characteristics.

Results revealed that synthetic drug users differed significantly from heroin users in that they were on average younger, better educated, and less likely to be migrants. Probably reflective of the more recently emerging synthetic drug epidemic, synthetic drug users had been using the drugs for a much shorter time than heroin users. Qualitative data from in-depth interviews and focus group discussion also indicated that compared to heroin synthetic drugs were more expensive and their use considered trending and high status, therefore appealing more to the young and those with higher income. Consistent with the literature (Halkitis & Palamar, 2008; Halkitis, Palamar, & Mukherjee, 2007; O’Grady, Arria, Fitzelle, & Wish,

2008), synthetic drug users were more likely to be polydrug users and to use drugs in entertainment venues, both of which were considered risk factors of unprotected sex with casual partner(s).

However, the multiple regression analyses (Table 4) did not find any significant association between using drugs in entertainment venues and risky sexual behavior. It may be that the association was mediated by the other drug-use related factors controlled for in the analyses. Such mediation was indirectly confirmed by rerunning Model 2 (Table 4) without the three statistically significant drug-use related variables, of which the results (not presented but available upon request) indicated that "used drug in entertainment venue" was a significant and powerful risk factor for all three measures of unprotected sex with casual partner(s). It appears that use drugs in a venue or group setting is not of itself a risk factor; it is rather the type of drugs used (synthetic drug or polydrug vs. heroin) and post-use group sex in a venue/group setting that are associated with elevated likelihood of unprotected sex with casual partner(s).

Synthetic drug users were significantly more likely to report post-use feelings of excited/madness, sexual arousal, and talkative but much less likely to report feelings of relaxed/calm, care-free/worry-free, and sleepy. Qualitative data corroborated the survey findings. When asked about post-use feelings, in-depth interview participants replied "… heroin made you forget everything, good or bad, and was sometime used to numb the mind and obtain temporary relief from life experiences… " and like sleeping pills "all you did was to fall asleep after using heroin." By contrast, participants described synthetic drugs as "energizers" and use of them made you feel "full of energy" and look for things to do to "vent."

While the literature on causes of drug abuse generally does not make distinctions between synthetic drug and heroin use, we found some significant differences between the two drug using groups in our study sample. Synthetic drug users reported slightly fewer personal experiences of events disrespect of laws and social norms (Table 2), indicating indirectly that they generally felt stronger social control than heroin users. In other words, felt social control had less of a deterrent effect on synthetic drug than heroin use. Qualitative data further suggested that even with the recent scaled-up measures against synthetic drug use, punishment remained lighter for synthetic drug use than for heroin use. For example, people caught using heroin would be immediately sent to years of compulsory drug rehab while those caught using synthetic drugs would only be fined and subject to a few days of administrative detention. This lighter punishment, along with the perception that use of synthetic drugs could not be detected after a day or less, was cited by focus group participants as the reason for many users to choose or switch to synthetic drugs.

Compared to their heroin counterparts, synthetic drug users appeared to be more amenable to social influences and were more likely to self-report having more drug-using friends before their own use of the drugs. However, it is interesting to note that synthetic drug users were slightly less likely than heroin users to self-report peer, family, or environmental influence as reasons to use the drugs (Table 2). A further separation of the three sources of social influence (results not presented but available upon request) revealed that significantly

more synthetic drug users than heroin users (36.4% vs. 18.7%) reported setting or environmental influence as the reason to use but fewer reported family influence (2.1% vs. 5.3%) as the reason. Further, peer influence was cited most frequently as a cause of drug use for both groups (57.4% for synthetic drug and 61.7% for heroin users, respectively), but the two groups did not differ significantly in reporting peer influence as the reason. Qualitative data, however, suggested greater peer influences in understanding synthetic drug use, particularly among the young. Participants in in-depth interviews and focus groups frequently pointed to the importance of social network of friends and peer pressure for synthetic drug use but less so for heroin use. It appeared that synthetic drug use was influenced more by peers or surrounding environments while heroin use was more by family.

With respect to drug dependence, synthetic drug users self-reported significantly less physiological and psychological dependence. It is not clear if the dichotomous self-report of drug dependence (yes or no) could accurately capture respondents' status of drug dependence. But there appeared a general lack of awareness of the harmful effect of synthetic drugs. Qualitative data frequently pointed to this knowledge gap. Unlike heroin, of which the harmful impact of abuse has been well publicized through years of continuous public anti-drug education and more recently through its link to HIV/AIDS, synthetic drugs are still considered by many harmless and non-addictive. Participants in focus groups all seemed to agree that synthetic drugs were not as addictive as heroin, a major reason for heroin users to switch to synthetic drugs. At the same time, many believed in the stimulant effect of synthetic drugs, such as help to stay alert, keep concentrated, lose weight, and socialize, which was also cited as the reason people choose/switch to synthetic drugs.

Compared to heroin users, synthetic drug users were significantly more likely to engage in risky sex after using drugs and consequently at greater risks of acquiring or transmitting HIV/STIs. Even so, synthetic drug users appeared to have significantly fewer STIs since starting drug use. As synthetic drugs are more recently available, it may be that their users, on average, have been subject to the harmful behavioral impact of synthetic drugs and in turn risk of STIs for shorter durations than heroin users, which was clearly suggested by the average years since first use of the drug (Table 1). However, the control of years since first use (results not presented but available upon request) did not make any difference; synthetic drug users remained to have fewer STIs than heroin users. Future research is needed to examine as why synthetic drug users' riskier sexual life did not lead to higher incidence of STIs.

Consistent with the bivariate comparisons, the logistic regression results confirmed that after controlling for individual sociodemographic characteristics, causes of drug use, and drug use related factors synthetic drug use remained a significant and powerful risk factor for having unprotected sex with a casual partner. In addition, polydrug use and having group sex following drug use, the two characteristics that were highly correlated with synthetic drug use (Fendrich et al., 2003; Xia & Yang, 2008; Zule et al., 2007), were both independent and significant risk factors on their own for having unprotected sex with a casual partner.

One study limitation is that the data were more than 10 years old and were based on samples of drug users in compulsive drug rehab facilities (heroin users) or detention centers (synthetic drug users). They might not be representative of community drug users and given the fast-evolving drug epidemics in China they might no longer reflect the current patterns of drug abuse. However, the qualitative data from an on-going research, which we used to supplement the survey findings in the discussion, appeared to have corroborated the broader patterns and findings from the survey data. Future research should try every effort to recruit representative samples of community drug users. Another limitation is that the survey data were based entirely on self-reports. Given the sensitivity of the data, self-report of drug use/sexual behavior and their related characteristics may be subject to biases, the extent and direction of which could not be assessed. Future research should try to incorporate biomarker testing of drug use and STIs to verify/supplement the self-reported data. Future research could also benefit from using a computer assisted interview technique in collecting sensitive behavioral data, such as computer assisted personal interview, audio computer assisted self-interview, or some combination of computer assisted self-interview and face-to-face personal interview.

With the study limitations in mind, the results helped to shed light on the two questions the study tried to answer. First, the causes of drug use likely differ between synthetic drugs and heroin. There remains a general knowledge gap concerning the harmful impact of the various synthetic drugs, which, along with the lesser formal control over and punishment for synthetic drug use, appears one important reason people try or switch to synthetic drugs. Educational intervention is urgently needed. To be effective, education campaigns need to pay special attention to developing messages that emphasize the long-term harmful impact while recognizing the short-term “good” stimulating effects, such as keeping users alert and concentrated, as well as the fact that synthetic drug use may take longer to develop dependence, but it *is* addictive with serious health consequences. An educational intervention needs also to pay more attention to peer influences on the initiation of synthetic drug use, imploring parents and schools to be vigilant on youth’s network of friends.

Second, synthetic drug users are indeed riskier in their sexual life than heroin users, putting them and their partner(s) at elevated risks of acquiring/transmitting HIV/STIs. The riskier sexual life likely results from both the stimulant effect of synthetic drugs and from polydrug use and group sex following drug use, which are more characteristic of synthetic drug users than heroin users. Although the survey data did not show higher incidence of STIs among synthetic drug users than heroin users, it may just be the limitation of self-reporting or the issue of time. There is no question that unprotected sex with casual partner(s) increases the risk of acquiring and/or transmitting HIV/STIs. Behavioral interventions are urgently needed to reduce the unprotected sex with casual partner(s) among synthetic drug users. Again, to be effective, the interventions need to address both the knowledge gaps, including the stimulant effect of synthetic drugs and the association between unprotected sex and HIV/STIs, and the influences of peers and surrounding environments.

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TABLE 1.

Sociodemographic and Drug Use Characteristics by Type of Drug User

	Synthetic Drug Users		Heroin Users	
	% or Mean	***n***	**% or Mean**	***n***
Sociodemographic characteristics:				
Male (%)	73.7	538	71.2	502
Age (mean in years)	32.6**	729	35.3	705
Married (%)	40.6	296	42.8	302
High school or more education (%)	43.3*	316	36.9	260
Employed (%)	54.5	398	55.1	386
Temporary migrant (%)	23.0**	168	31.8	224
Drug use characteristics:				
Age first use (mean)	30.1**	726	27.4	705
Years since first use (mean)	2.5**	726	7.9	705
Polydrug use (%)	44.5**	319	5.3	37
Use drugs in entertainment venue (%)	65.1**	475	11.6	82
Post-use feeling agitated (%)[a]	66.2**	483	24.4	172
Post-use feeling relaxed (%)[b]	38.5**	281	80.1	565

Note.

[a]Includes self-reported post-use feelings of excited/madness, sexual arousal, wanted to vent, and sleepless/talkative;

[b]includes self-reported post-use feelings of carefree/worry-free, very comfortable, and sleepy.

*$p < .05$.

**$p < .01$.

TABLE 2.

Likely Causes of Use by Type of Drug User

	Synthetic Drug Users		Heroin Users	
	% or Mean	*n*	% or Mean	*n*
Social control:				
Composite social control index variable (mean)	16.0**	729	15.6	705
Having good/very good relationship to parents (%)	72.6	530	74.2	523
Felt going to school is useless (%)	44.8	323	43.2	304
Felt working to earn a living is pointless/boring (%)	43.1	311	39.3	276
Agree that life does not need to be serious (%)	60.7	438	63.9	449
Agree that one cannot always follow rules (%)	66.5	480	64.5	454
Felt life aimless and empty (%)	45.6	329	41.6	293
Felt the need to release extra energy (%)	51.7	374	50.1	353
Social influence:				
Composite social influence index variable (mean)	27.1**	725	26.1	705
Had drug using friends before own use (%)	55.0**	377	44.7	304
Number of drug using friends (mean)	2.6**	686	0.8	680
Peer/family/setting influence as reasons to use (%)[a]	67.7**	494	70.6	498
Sensation seeking:				
Composite sensation seeking index variable (mean)	12.9	724	13.0	705
Sensation seeking as reason to use (%)[b]	77.5	566	78.9	556

Note.

[a] Includes self-reported peer, family, or environmental influence as reasons for drug use;

[b] includes self-reported curiosity and sensation seeking as reason for drug use.

** $p < .01$.

TABLE 3.

Self-Reports of Consequences of Drug Use by Type of Drug User

	Synthetic Drug Users		Heroin Users	
	%	*n*	%	*n*
Post-use dependence and behavior:				
Physiological dependence (%)	11.8**	86	75.9	535
Psychological dependence (%)	35.2**	257	85.7	604
Destructive behavior (%)	10.6	77	10.1	71
Risky sexual behavior:				
Ever had unprotected sex (U.S.) with a non-stable partner (%)	54.1**	395	34.6	244
Had U.S. with a non-stable partner past 30 days (%)	43.0**	314	23.3	164
Had U.S. with a non-stable partner past 3 sexual experiences (%)	22.6**	165	13.6	96
Ever had group sex following drug use (%)	11.0**	76	3.5	24
STDs since starting drug use (%)	3.8**	28	7.2	51

** $p < .01$.

TABLE 4.

Logistic Regression Analysis of Risk Factors of Unprotected Sex With a Non-stable Partner

	Unprotected Sex With a Non-stable Partner					
	Lifetime		Past 30 Days		Past 3 Sexual Experiences	
Independent Variables	**1**	**2**	**1**	**2**	**1**	**2**
Sociodemographic characteristics						
Male[a]	1.47**	1.49**	1.19	1.12	3.74**	3.51**
Age	0.97**	0.99	0.97**	0.96**	1.00	1.02
Currently married[a]	0.84	0.78*	0.74*	0.69**	0.87	0.84
High school or more education[a]	0.91	0.87	0.76*	0.73*	0.97	0.90
Employed[a]	0.94	0.91	1.12	1.09	0.84	0.78
Temporary migrant[a]	0.75[b]	0.78	0.75[b]	0.74[b]	0.92	0.93
Causes of drug use						
Social control index variable	0.82**	0.84**	0.83**	0.85**	0.78**	0.80**
Social influence index variable	1.04**	1.03**	1.02	1.02	1.00	1.00
Sensation seeking index variable	1.25**	1.20**	1.26**	1.21**	1.26**	1.17**
Drugs used and related factors						
Synthetic drug user[a]	2.39**	2.09**	2.70**	2.14**	1.93**	1.60[b]
Age of first use of the drug	—	0.98	—	1.01	—	0.98
Polydrug user[a]	—	1.53*	—	1.49*	—	1.43[b]
Ever had group sex after using drug	—	2.16**	—	2.35**	—	4.23**
Used drug in entertainment venues	—	1.24	—	1.00	—	1.04
Sample size	1423	1352	1423	1352	1423	1352
Model pseudo R^2	0.14**	0.15**	0.13**	0.15**	0.15**	0.19**

Note. Results presented in the table are odds ratios. A non-stable partner is any heterosexual partner other than spouse, girl/boyfriend, or lover.

[a]Entered as a dummy variable; the reference categories are female, currently not married, less than high school education, unemployed, non-migrant, heroin user single drug user for the corresponding dummy variables;

[b]Significant at the 10% ($p < .10$) level.

*$p < .05$.

**$p < .01$.