



Substance use disorders and sexual behavior; the effects of alcohol and drugs on patients' sexual thoughts, feelings and behavior



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HIGHLIGHTS

- Addicts experience a relationship between substance use and sexual behavior
- About ten percent state that sexual thoughts and feelings causes craving
- A quarter of the patients link sexual thoughts, feelings and behaviors to drug use
- GHB-users perceive most enhancements in sexual functioning
- Users of alcohol are sexually less active than users of other substances

ARTICLE INFO

Keywords:

Substance abuse
Addictive behavior
Sexual behavior
Sex
Recovery treatment programs

ABSTRACT

Introduction: Hardly any research exists on the relationship between substance use and sexual behaviors in patients with a substance use disorder. This study aimed to examine this relation by looking into perceived positive effects on sexual behavior, perceived negative effects and risky sexual behavior due to substance use in patient groups of users of alcohol, stimulants, sedatives and Gamma hydroxybutyrate (GHB). In addition, the current study aimed to address the question whether sexual behavior (e.g. number of sexual partners, sexual activity) differs between these patient groups.

Method: A total of 180 patients with a substance use disorder (i.e. alcohol, amphetamine, cannabis, cocaine, GHB and opiates) participated. A self-report questionnaire was administered with questions on substance use, sexual behaviors (e.g. sexual activity, masturbation, use of pornography) and statements about the perceived changes in sexual functioning and behavior under influence of the primary substance of abuse.

Results: All four groups reported changes in sexual thoughts, feelings and behavior due to the use of their primary substance. More than half of the patients reported enhancements in sexual domains (i.e. sexual pleasure, sexual arousal, sexual behavior), but also decrements or risky behaviors and about a quarter stated that their sexual thoughts, feelings and behaviors were often associated with the use of their primary substance of abuse. Patients with a GHB use disorder reported the strongest relation between drug use and sexual behavior. Users of GHB not only reported more enhancement in several sexual domains, but also less decline in sexual domains compared to the other patient groups and more risky behavior or more sexual activity than some of the other groups of patients.

Conclusions: The results underline the importance of addressing the relationship between substance use and sexual behavior in treatment programs, as patients may be hesitant to stop their use of substances when they experience many positive effects in their sexual behavior. Future research directions are suggested.

1. Introduction

A lot has been written about sexual behavior and substance use, but hardly any research exists about the effects of the use of substances on sexual behavior of patients with a substance use disorder. Concerning

sexual behavior and substance use disorders in non-patient samples the focus has primarily been on risky sexual behavior (Buffum, 1988; Celentano, Latimore, & Mehta, 2008; Zapata, Hillis, Marchbanks, Curtis, & Lowry, 2008). Drug users have consistently been identified as a population with elevated infection rates of sexual transmitted

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<https://doi.org/10.1016/j.addbeh.2018.07.005>

Received 9 March 2018; Received in revised form 28 May 2018; Accepted 5 July 2018

Available online 06 July 2018

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infections, including HIV (Adrian, 2009; Celentano et al., 2008; Khan et al., 2013; Maranda, Han, & Rainone, 2004; Zapata et al., 2008), but less clear is whether this can be attributed to the effects of the substance alone (Celentano et al., 2008; Khan et al., 2013; Kopetz, Reynolds, Hart, Kruglanski, & Lejuez, 2010; Rawson, Washton, Domier, & Reiber, 2002). Several studies found that the use of crack-cocaine is associated with higher levels of risk taking sexual behavior (e.g. elevations in numbers of sex partners and sex trade, decreased use of condoms) than is the use of other drugs such as opiates (Celentano et al., 2008; Khan et al., 2013; Lejuez, Bornovalova, Daughters, & Curtin, 2005), but these differences may also be explained by other factors that may contribute to fluctuations in risky sexual behavior in patients with a substance use disorder, such as gender, sexual orientation, race and social context (Celentano et al., 2008; Kopetz et al., 2010). Nonetheless, it appears that the use of certain drugs, especially crack-cocaine, is associated with risky sexual behavior and that the use of other drugs, such as opiates, is either not associated or less associated with such behavior.

With regard to non-risky sexual functioning and behavior it has been found in non-patient samples that small amounts of alcohol and cannabis can enhance sexual arousal and performance, but also that high doses can inhibit sexual functioning (Gianotten, 2009; Miller & Gold, 1988; Washton & Zweben, 2006). In 2015 Eaton et al. estimated that 4.3 million American adults annually engage in regularly sex-related alcohol consumption (i.e. drink alcohol before sex). Although alcohol is a central nervous system depressant that slows down several body systems and suppresses the sexual physiology, thereby inhibiting sexual functioning (Peugh & Belenko, 2001; Stoeckhart, Swaab, Gijis, de Ronde, & Slob, 2009), it had been found that the anticipated effect of alcohol can enhance sexual desire (George & Stoner, 2000; McKay, 2005; Peugh & Belenko, 2001). Thus, there is a relationship between alcohol use and sexuality, but this relation appears to be complex. In addition, a recent study found marijuana use to be associated with increased sexual frequency while it did not appear to impair sexual function (Sun & Eisenberg, 2017). Similarly, cocaine has been found to delay orgasm and to enhance sexual pleasure and arousal on the one hand, but also to be associated with erectile dysfunction on the other hand (Gianotten, 2009; Peugh & Belenko, 2001). In addition, studies have found that chronic use of cocaine diminishes sexual desire and hampers orgasm (Peugh & Belenko, 2001; Weatherby et al., 1992). Furthermore, the drug Gamma Hydroxybutyrate (GHB) is well known for enhancing sexual arousal (Nicholson & Balster, 2001). These findings show that the use of substances can have effects on the sexual, thoughts, feelings and behavior of people and that these effects may be positive and negative.

The aforementioned findings raise the question whether positive or negative associations between substance use and sexual functioning or sexual behavior can also be found among people who receive treatment for their use of substances. This question is important because the perceived relationship between substance use and sexuality may play a role in the effect of treatment for substance use. It may be difficult to abstain from substances if the patient considers sex under the influence of a psychoactive agent to be more rewarding than sober sex or if the patient experiences that abstaining from the substance negatively impacts their sexual desire or pleasure. In this respect, it has been stated that “without any scientific knowledge about the connection between substance use and sexual behavior, treatment of patients who experience a strong drugs-sex connection is based on myths and speculations” (Rawson et al., 2002, p. 104).

Being diagnosed with a DSM-IV alcohol dependence is associated with significantly increased odds of being a regular presex drinker (Eaton et al. (2015)). In addition it has been found that adults in substance use treatment commonly report combining sex and alcohol or drugs at their most recent sexual event (Calsyn et al., 2010). These studies only looked into the prevalence of sex under the influence within the population and the association with high-risk sexual behavior, not in to the association or relation between substance use and

sexual behavior. In one of the rare studies regarding this topic in a population of patients with a substance use disorder, Rawson et al. (2002) found that different categories of drugs were associated with different reported effects on sexual behavior. Methamphetamine users reported an increase of sexual thoughts, behaviors and activity. Cocaine users also reported a positive, but weaker relationship between the use of cocaine and their sexual behavior. Alcohol users reported an even weaker association. Furthermore, opiate users reported virtually no relationship between the use of drugs and their sexual behaviors. Unfortunately, Rawson et al. (2002) looked only into enhancement in sexual thoughts, feelings and behavior under the influence of a substance and not into negative effects of drug use on sexual thoughts, feelings and behavior. This is unfortunate because, as shown, studies in the general population have shown positive as well as negative effects of drug use on sexual functioning and behavior. In addition, Rawson et al. (2002) addressed only the perceived effect of a substance which leaves it uncertain whether there were also actual changes in sexual behavior (i.e. more frequent sexual activity, more sexual partners, more risky sexual behavior, etc.) or whether these sexual behaviors differed between the different type of drug users.

In line with Rawson et al. (2002), a few other studies in patient samples found that (meth)amphetamine users endorse primarily positive associations between drug use and sexual thoughts, feelings and behavior (Hamilton Brown, Domier, & Rawson, 2005; Isa et al., 2013; Skarner & Svensson, 2013). In addition, patients with a cocaine use disorder have been found to report both positive and negative effects of drug use on sexual functioning and behavior (Hamilton Brown et al., 2005; Kopetz et al., 2010). However, these studies, too, focused mainly on a perceived sexual effect of the substance and did not address actual sexual behaviors.

The purpose of the current study was to further examine perceived sexual effects of drug use and actual sexual behavior in patients with a substance use disorder. Because patients may perceive positive associations between their substance use and the perceived sexual functioning as well as negative associations, both types of associations were addressed in the present study in addition to associations with risky sexual behaviors. These perceived associations and behaviors were studied in four types of patients: users of alcohol, stimulants (i.e. amphetamine, cocaine), sedatives and GHB.

Building on the work of Rawson et al. (2002), we hypothesized that patients with a stimulant use disorder experience more positive effects of the use of the substance on their sexual thoughts, feelings and behaviors than do patients with an alcohol use disorder, who in turn experience more positive effects than do patients with a sedative use disorder. We did not have specific hypotheses with regard to different experienced negative effects in these groups of patients, so these eventual differences were explored. In addition, we explored the sexual activity and behavior (e.g. number of sexual partners, sexual activity) of patients with a substance use disorder and compared these variables among the four subgroups.

2. Method

2.1. Participants

The participants in this study were patients ($N = 208$) with a DSM-IV-tr (APA, 2000) substance use disorder who had enrolled in one of the inpatient or outpatient treatment programs at a specialized institution for addiction care in the North of the Netherlands (Verslavingszorg Noord Nederland).

Inclusion criteria for participation were having a DSM-IV-tr substance abuse disorder (alcohol, amphetamine, cannabis, cocaine, GHB or opiates) as the primary diagnoses, being at least 23 years of age and being abstinent at the moment of admission. It was decided not to include patients who had been abstinent for more than six months at the time of sampling and patients who had experienced a psychotic episode

or had displayed suicidal ideations in the previous month. The use of more than one substance was allowed only when the participant was able to clearly identify one substance as their primary drug of abuse.

From the 208 participants who gave their informed consent, 180 filled in the survey. Reasons for withdrawal were reconsidering participation or not replying on requests to start the assessment. Participants ($N = 180$) met the diagnostic criteria for DSM-IV-tr (APA, 2000) for abuse or dependence of alcohol, amphetamine, cannabis, cocaine, GHB or opiates as the primary diagnosis. 31% of the participants were treated in an inpatient treatment-program, whilst 69% received outpatient treatment.

To ensure the sample to closely resemble a usual patient sample, participants were divided into different groups according to what they, themselves, registered in the Substance Use and Sexual Behavior questionnaire (SUSBQ) as their reported primary drug of abuse or dependence: alcohol ($N = 73$), stimulant (i.e. cocaine ($N = 31$) or amphetamine ($N = 15$)), sedative (i.e. cannabis ($N = 24$) or opiates ($N = 22$)) and GHB ($N = 15$). A total of 64% used another substance besides their primary substance of abuse or dependence. This distribution of primary substance was representative for all SUD patients in Dutch addiction mental health care institutions (see Wisselink, Kuijpers, and Mol (2016) for the Dutch national statistics on patients), with the exception of patients with the misuse of amphetamine (8% in the sample vs 3% in the entire population) and GHB (8% vs 1%). These two types of patients were overrepresented in the sample due to the extra effort of having sufficient numbers of such users in the sample, whereby the original intention based on power analysis was to have at least 39 patients in each group.

Of the respondents, 69% were male and the mean age of the participants was 40.20 years ($SD = 11.52$ years, age range 19–71). As such, the sample was representative for all SUD patients in Dutch addiction mental health care institutions with regard to gender (76% male) and age ($M = 42$ years). 41% had a relationship. Sexual orientation was reported by 85% as heterosexual, 4% as gay/lesbian and 11% as bisexual.

2.2. Instruments

The Substance Use and Sexual Behavior questionnaire (SUSBQ) is a self-constructed 69-item survey that was adapted from the instrument that was constructed by Rawson et al. (2002). The SUSB has six background questions (age, gender, education level, ethnicity, relationship status, residence), six questions about substance use (e.g., primary substance of abuse, use of other substances, substance use in the previous thirty days, use of medication), twenty-nine questions about sexual behavior (e.g. sexual experience, number of sexual partners, sexual frequency, same sex sexuality, masturbation, sexual explicit media use and sex on or through the internet (i.e. webcam sex, dating via internet), sexual daydreaming/fantasies, sexual dysfunction) and three questions about treatment history (for substance use disorder and other psychopathology). In addition, the SUSB has 25 statements about the perceived changes in sexual thoughts, feelings and behavior under influence of the primary substance of abuse that require an answer on a 5-point scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Of the 25 statements, six items addressed the perceived enhancement of sexual drive, sexual pleasure, sexual performance, sexual interest/obsession and unusual sexual behavior. These six items were combined to form the 'Perceived enhancement' scale, which counts the number of perceived enhancements, ranging from 0 (*no reported enhancement*) to 6 (*six reported enhancements*). In addition, the two items on perceived relationship with risky sexual behavior and occasional sexual behavior (i.e. 'I am more likely to practice "risky" sex under the influence of my primary drug of abuse' and 'I have become involved in sex acts that are unusual for me when I am under the influence of my primary substance of abuse') were combined to form the 'Perceived risk' scale, which counts the number of perceived risks, ranging from 0 (*no reported*

change in risky behavior) to 2 (*two reported changes in risky behavior*). Finally, the six items about perceived decline in sexual drive, sexual pleasure, sexual performance, sexual interest/obsession, sexual behavior (frequency and inhibition) were combined to form the 'Perceived decline' scale, which counts the number of perceived declines, ranging from 0 (*no decline*) to 6 (*six reported decrements*). All three scales had adequate test-retest reliability after one week ($0.69 < r < 0.86$) and good internal consistency (Cronbach's alphas at least 0.84).

The severity of the substance use disorder and the DSM-IV-tr diagnosis were based on the Measurements of the Addiction for Triage and Evaluation (MATE: Schippers, Broekman, & Buchholz, 2011). Conceptually, the MATE was constructed according to the ICD and International Classification of Functioning (ICF) in the World Health Organization (WHO) classification system). The instrument consists of ten components that explore, among others, current problematic substance abuse and history of drug use, history of healthcare, somatic complaints, as well as social and environmental support networks. It assesses the diagnoses dependence and abuse according to the DSM-IV-tr. The MATE yields 20 sum scores, which can be summarized into four dichotomized so-called dimension scores: Addiction severity, severity of psychiatric co-morbidity, severity of social disintegration, and history of treatment for substance-use disorder. The MATE is considered to have a good inter-rater reliability, which shows to be better with more training in administering the MATE (Schippers et al., 2011), and adequate validity when compared to the World Health Organization Disability Assessment Schedule (WHODAS) (Schippers & Broekman, 2007).

2.3. Procedure

Prior to the start of this study, the research proposal was reviewed and approved by the Medical Ethical Committee of the University Medical Center Groningen (UMCG) in accordance with the 1999 Dutch Law on Medical Scientific Research involving Human Beings. The study was conducted from January 2016 until June 2017 in five outpatient clinics and two inpatient clinics of the institution.

Patients were asked for their participation after their intake. Extra effort was made to include patients with an amphetamine use disorder, cocaine use disorder and GHB use disorder to create groups of about equal size.

During the intake, the MATE (Schippers, Broekman, Buchholz, Koeter & van den Brink, 2010) was administered by trained professionals, to acquire information about the severity of the substance abuse and the DSM-IV-tr classification. Based on the information derived from the MATE and the admission intake, chartered (clinical) psychologist, masters in addiction medicine or psychiatrists determined the DSM-IV-tr classification of a substance abuse or dependence disorder.

Before filling in the questionnaire 'Substance Use and Sexual Behavior' (SUSB), patients were asked to give written informed consent. Participation was voluntary and confidential. Participants could fill in the SUSB in the presence of one of the researchers or online on a secured website.

2.4. Statistical analyses

The first aim of this study was to compare perceived associations between the use of substances and sexual thoughts, feelings and behavior across four groups of patients with a substance use disorder (i.e. alcohol, sedatives, stimulants, GHB). For this purpose the three scales (i.e. Perceived enhancement, Perceived decline, Perceived risk) were created. A MANOVA analysis, using Pillai's trace, was employed to compare the total scores of the three dependent variables across the four groups and to control for answering tendency between the dependent variables. Pillai's trace was chosen since this test is considered to be the most powerful and robust statistic for general use.

In order to test the hypothesis that patients with a stimulant use disorder experience more positive effects of the use of the substance on their sexual thoughts, feelings and behavior than do patients with an alcohol use disorder, who in turn experience more positive effects than do patients with a sedative use disorder, the mean score on the Enhancement scale was compared across the four groups using a ANOVA analysis. A Games-Howell post-hoc test of pairwise comparison was conducted to elucidate which group differed significantly from other groups. Games-Howell post-hoc test was chosen, because it does not assume equal sample sizes and variances. We chose not to add preplanned contrasts to the analyses, since GHB was added as an extra group and no scientific information was available about GHB users experience more or less positive effects of the use of the substance than the other groups of substances. In addition, the same analyses were conducted on the other two scales (Perceived decline, Perceived risk) to compare the different mean scores across the four groups.

The second aim of this study was to explore the actual sexual behavior of patients with a substance use disorder and to compare these behaviors across the four subgroups. To compare the sexual behavior in the previous six months (e.g. number of sexual partners, frequency of sexual encounters, frequency of masturbation) between the four groups, non-parametric tests (Kruskal-Wallis test) and chi-square analyses were conducted. Levene's test of homogeneity showed that the variance of equality for the number of sex partners in the previous six months was unequal ($F(3, 176) = 12.85, p < .001$). This meant that a Kruskal-Wallis test needed to be conducted to compare the number of sex partners in the previous six months across the four groups. To elucidate which group differed significantly from the other groups additional Mann-Whitney tests were conducted, using a Bonferroni correction for multiple comparisons.

For all the analyses pairwise deletion of cases were used for handling missing data.

3. Results

All four groups reported perceived changes in sexual thoughts, feelings and behavior due to the use of their primary substance. Of the total sample 59.4% reported enhancements in at least one sexual domain (i.e. sexual drive, sexual pleasure, sexual performance, sexual interest/obsession and unusual sexual behavior.) ($M = 1.80$ changes, $SD = 1.92$ changes) and 60.6% reported decrement in at least one sexual domain ($M = 1.61$ changes, $SD = 1.88$ changes). In addition, 50.6% of the total sample reported at least one change in risky sexual behavior ($M = 0.82$ changes, $SD = 0.89$ changes).

Of the total sample 23.3% stated that their sexual thoughts, feelings and behaviors were often associated with the use of their primary substance of abuse. In addition, 11.4% of the participants stated that they experienced such a strong association between sex and substance use that they encountered difficulties in separating drug use from their sexual behavior. Furthermore, 9.7% of the participants stated that sexual thoughts and feelings cause craving and 9.1% of the participants felt that they needed treatment for their sexual behavior as they felt that it was linked to the use of their primary substance of abuse.

Of the participants 27% reported that they had had two or more sexual partners in the previous six months, 24.0% reported having sex at least a few times every week in the past six months, and 43.9% reported to masturbate at least once a week. In addition 31.7% of the participants used pornography weekly or more often, 5.6% reported to participate in cybersex (i.e. webcam sex, sex-chatting) and 16.7% stated having had sexual encounters via the Internet in the past six months.

3.1. Perceived changes in sexual thoughts, feelings and behavior due to substance use in the four groups

A MANOVA analysis, using Pillai's trace, revealed that the three perceived changes scales differed significantly between the four patient

Table 1

Mean scores, standard deviation on the number of perceived changes scales in sexual functioning for users of alcohol ($N = 73$), sedatives ($N = 46$), stimulants ($N = 46$) and GHB ($N = 15$).

Scale	Alcohol	Sedatives	Stimulants	GHB
Perceived enhancement M (SD)	1.49 _a (1.78)	1.0 _{a,b} (1.43)	2.48 _c (1.99)	3.67 _{b,c} (1.80)
Perceived decline M (SD)	1.62 _a (1.83)	2.15 _a (2.12)	1.48 _a (1.79)	0.27 _b (0.46)
Perceived risk M (SD)	0.90 _a (0.92)	0.46 _b (0.71)	0.87 _{a,b} (0.86)	1.40 _a (0.83)

Note. Means in a row sharing a subscript are not significantly different at $\alpha = 0.05$, based on Games-Howell post hoc analyses; M = mean; SD = standard deviation.

groups ($V = 0.23, F(3, 174) = 4.91, p < .001$) (see Table 1). Following ANOVAs of the scales revealed significant differences on the mean scores of Perceived enhancement ($F(3, 176) = 11.78, p < .001$), Perceived decline ($F(3, 176) = 4.12, p < .01$) and Perceived risk ($F(3, 176) = 3.92, p < .001$). Post-hoc tests of pairwise comparison using the Games-Howell post hoc criterion showed that GHB patients and patients who used stimulants perceive significantly more sexual enhancement than did patients that used alcohol or sedatives (both $p < .05$). No significant differences on the Perceived enhancement scale were found between GHB patients and patients that used stimulants, and between patients that used alcohol and patients that used sedatives.

With regard to the reporting of perceived sexual decline the GHB group perceived less decline than did the other three groups of patients (all $p < .05$). No further significant differences were found on the Perceived decline scale.

Similar analyses revealed that patients that used GHB reported significantly more perceived risky sexual behavior than did patients that used a sedative ($p < .05$). In addition, patients that used a sedative reported significantly less perceived risky sexual behavior than did patients that used alcohol ($p < .05$). No further significant differences were found on the Perceived risk scale.

3.2. Other perceived associations in the four groups

Chi square analyses revealed that the four groups did not differ with regard to the percentages of patients reporting about a self-perceived association between sexual thoughts, feelings and behaviors and the use of their primary substance of abuse ($\chi^2(3) = 3.76, ns$), sexual thoughts and feelings causing craving ($\chi^2(3) = 5.82, ns$), the need for treatment for their sexual behavior ($\chi^2(3) = 6.64, ns$). Similar analyses revealed a significant difference between the groups regarding experiencing difficulties in separating drug use from their sexual behavior ($\chi^2(3) = 9.09, p < .05$). None of the users of a sedative stated that they experienced a difficulty in separating the use of their primary substance from their sexual behavior. This percentage was significant lower than for the other three groups (all $\chi^2(1) > 6.18, all p < .005$).

3.3. Actual sexual behavior and activity in the four groups

The patient groups differed from each other in their sexual behavior and activity in the six months before assessment (see Table 2). For a start, a Kruskal-Wallis test revealed that the mean number of sexual partners in the past six months differed significantly between the four groups ($H(3) = 18.29, p < .01$). Additional Mann-Whitney tests showed that the mean number of sexual partners was significantly lower for patients that used alcohol than for the patients that used stimulants ($U = 1060.0, r = -0.33, p < .01$) or GHB ($U = 288.5, r = -0.33, p < .01$). Similar analyses revealed differences in the

Table 2

Sexual behaviors in the previous six months for users of alcohol (N = 73), stimulants (N = 46), sedatives (N = 46) or GHB (N = 15).

Variable	Alcohol	Sedatives	Stimulants	GHB
Mean number of sexual partners (SD)	0.89 _a (1.20)	1.59 _{a,b} (2.80)	1.76 _b (1.61)	3.93 _b (5.80)
% relationship	60.3	55.6	56.5	73.3
% > 2 sexual partners	13.7 _a	19.6 _{a,b}	43.5 _{b,c}	60.0 _c
% > weekly sexual contact	21.9 _a	34.7 _{a,b}	32.6 _b	60.0 _{a,b}
% > weekly masturbation	47.9 _a	45.6 _{a,b}	69.5 _b	60.0 _a
% > weekly use of porn	30.1	36.9	28.2	33.3
% cybersex	2.7	6.5	8.7	6.7
% sex via internet	11.0 _a	15.2 _{a,b}	19.6 _{a,b}	40.0 _b

Note. Means in a row sharing a subscript are not statistically different at $\alpha = 0.01$, using a Bonferroni correction for multiple comparison. No subscript within a row means no significant difference at $\alpha = 0.05$ between the groups; SD = standard deviation.

frequency of sexual contact with a partner in the past six months ($H(3) = 10.42$, $p < .05$), with users of stimulants ($U = 1216.5$, $r = -0.24$, $p < .001$) and users of GHB ($U = 326.5$, $r = -0.27$, $p < .05$) being significantly more sexually active than users of alcohol. Furthermore, chi-square analysis showed a significant difference between the four groups with regard to the percentage of having more than two sexual partners in the previous six months ($\chi^2(6) = 24.54$, $p < .001$). In this respect, the percentage of patients that used GHB was significantly higher than the percentage of patients that used alcohol or sedatives. ($8.95 < \chi^2(2) < 15.76$, both $p < .01$).

With regard to the frequency of masturbation in the past six months a significant difference was found between the four groups ($H(3) = 8.31$, $p < .05$). Patients using stimulants reported a significantly higher frequency of masturbation than did patients using alcohol ($U = 1215.0$, $r = -0.24$, $p < .001$). Furthermore, the frequency of sexual encounters via the Internet differed between the four groups of patients ($H(3) = 8.80$, $p < .01$), with users of GHB stating that they more often had had sexual encounters via the Internet than had users of alcohol ($U = 380.0$, $r = -0.33$, $p < .01$). There were no significant differences between the groups of users in the use of porn ($H(3) = 0.08$, *ns*) and frequency of cybersex ($H(3) = 2.05$, *ns*).

4. Discussion

The results clearly show that there is a relationship between the use of a psychoactive substance and sexual behavior within a population of patients with a substance use disorder. For a start, about a quarter of participants stated that their sexual thoughts, feelings, and behaviors were often associated with their primary substance. In addition, about one in every ten patients stated that sexual thoughts and feelings caused craving for the primary substance of abuse and about an equal number believed that they would experience difficulties separating the use of substance from their sexual behavior due to the association. Furthermore, about one in every ten patients stated that they needed treatment for their sexual behavior as it was linked to the use of their primary substance of abuse. Furthermore, a substantial percentage of patients with a substance use disorder reported perceived changes in sexual thoughts, feelings and behavior due to the use of their primary substance of abuse. Almost 60% reported that they experienced enhancements in several sexual domains (i.e. sexual arousal, sexual pleasure, sexual performance, sexual behavior) after using their primary substance of abuse. About equal numbers reported decrements in the different sexual domains (i.e. sexual arousal, sexual pleasure, sexual performance, sexual behavior) under the influence of a substance and more than half reported more risky sexual behaviors in this situation. Because all these percentages are high and in line with results from

previous studies (Hamilton Brown et al., 2005; Isa et al., 2013; Skarner & Svensson, 2013; Rawson et al., 2002), it can be concluded that substance use and sexual thoughts, feelings and behavior are related to each other in the minds of many patients with a substance use disorder.

The findings also show that the relationship between substance use and perceived sexual thoughts, feelings and behavior differs between different groups of patients. As expected (see also Rawson et al., 2002), patients using stimulants are found to experience more enhancements than do patients using alcohol, but these in turn are not found to experience more enhancements than do patients using sedatives. This finding appears to be at odds with other studies (Isa et al., 2013; Kopetz et al., 2010; Rawson et al., 2002), but can be explained by the fact that the present study combined users of opiates with users of cannabis. Additional analyses, comparing patients that used alcohol with patients that used opiates revealed the expected differences, because the patient group that used alcohol showed significantly more perceived enhancements in sexual functioning, less perceived decrement and more perceived risky sexual behavior than did the patient group that used an opiate.

Especially users of GHB and stimulants appear to experience more enhancements in sexual domains (e.g. sexual pleasure, sexual arousal, sexual performance) under the influence of the substance than do users of alcohol and sedatives. With regard to stimulants, this is in line with findings from previous studies (Hamilton Brown et al., 2005; Isa et al., 2013; Kopetz et al., 2010; Rawson et al., 2002; Skarner & Svensson, 2013), but GHB stands out even more as a substance with a strong relationship with perceived and actual sexual behaviors. Users of GHB not only reported more enhancement in sexual domains, but also less decline in sexual domains, more sexual partners in the previous months, a higher frequency of sexual encounters and more often sexual encounters via the Internet than did patients using alcohol, sedatives and stimulants. In addition, users of GHB reported more perceived risky behavior than did users of sedatives. In our knowledge, this is the first study that shows that patients of a GHB use disorder experience such a strong relationship between the use of GHB and sexual thoughts, feelings and behavior. Nonetheless, some caution is in place because of the small sample of GHB users. Small sample sizes are more likely to produce inflated effect sizes.

Compared to the users of other psychoactive agents, users of alcohol were found to be less sexually active (i.e. less number of sexual partners, lower frequency of sexual encounters and masturbation), despite the fact that they reported more risky behaviors after using alcohol than did users of a sedative. Thus, there appears to be a difference between the actual sexual activity and the reporting of a relationship between the use of alcohol and the sexual behavior. For the entire group of patients, more than half reported perceived changes in sexual thoughts, feelings and behavior under the influence of a substance, whilst only a quarter reported an association between sexual thoughts, feelings and behavior and substance use. This difference may be explained by an impaired (self) insight and awareness that is often found in patients with a substance use disorder (Probs, Manthey, Martinez, & Rehm, 2015; Stoddard Dare & Derigne, 2010).

With regard to actual sexual activity it strikes out that patients with a substance use disorder appear to be quite sexually active in comparison to the Dutch general population (see de Graaf (2012) for statistics in the Dutch population) as they more often had two or more sexual partners in the previous six months, more often reported about masturbating weekly or more, and more often reported about using pornography weekly or more. These findings again stipulate that substance abuse and sexual functioning and behavior are related to each other.

There may be three explanations for the relation between substance use and sexual behavior. Firstly, there may be a direct causal relation between the use of the substance and the sexual behavior due to the (psycho)pharmacological effects of the psychoactive agent, whereby the substance use enhances or inhibits sexual functioning, sexual

pleasure and arousal and delays or hampers orgasm (Gianotten, 2009; McKay, 2005; Miller & Gold, 1988; Nicholson & Balster, 2001; Peugh & Belenko, 2001; Washton & Zweben, 2006). Secondly, an indirect relation may exist because underlying factors may contribute to substance use as well as sexual behavior, such as less self-control, sensation seeking, and other biological, neurocognitive, psychological or social factors (see, Bornoalova, Lejuez, Daughters, Rosenthal, & Lynch, 2005, Caspi et al., 1997, Henderson, Galen, & DeLuca, 1998, Krueger et al., 2002). Thirdly, the nature of the relationship may be interpreted by the lifestyle that is associated with the (mis)use of a certain psychoactive agent, whereby the lifestyle also includes a higher exposure to sexual opportunities.

In the present sample, most participants reported multiple substance use, especially patients that used GHB (87%), implying that the relationship between sexual behavior and substance use may be due to underlying factors or a certain lifestyle associated with the use of a certain psychoactive agent, because multiple substance use is often associated with factors such as impulsivity, risk-taking behavior and sensation seeking (Henderson et al., 1998). These factors are part of the transdiagnostic factor externalization as proposed by Krueger, McGue, and Iacono (2001). Rodriguez-Seijas, Arfer, Thompson Jr, Hasin, and Eaton (2017) found a close association between sex-related substance use and the externalization spectrum.

Additional analyses on groups of patients reporting single drug use only, showed roughly the same (but not statistically significant) results, implying that the effects may be attributed to some extent to the pharmacological effect of the substance. However, because these further analyses were based on small sample sizes and because they yielded non-significant differences, no conclusions can be drawn from these further analyses. Future research is needed to understand the relationship between substance use and sexual behavior in patients with a substance use disorder and to explain the differences found between the groups of patients.

4.1. Limitations

The findings have to be considered with some concern about validity and generalizability because of the use of a new instrument that has not been further tested on validity. The reliability (both test-retest reliability as internal consistency) of the instrument showed to be fair to good, but less is known about whether answers were biased by recall bias, social desirability or fantasy. Herewith, it would be advisable to further test the validity of the instrument to measure the relationship between substance use and sexual thoughts, feelings and behavior.

In addition, the present study did not address differences between patients in inpatient treatment and patients in outpatient treatment, leaving questions about generalizability. Future research should address gender and sexual orientation as influencing factors, because studies have found gender differences in the prevalence of pre-sex substance use (Eaton et al. (2015) and the perceived relation between substance use and sexual thoughts, feelings and behavior (Rawson et al. (2002). Gilbert, Trocki, and Drabble (2015) showed that sexual minority men and women reported more presex drinking than did their same-gender heterosexual peers, showing that sexual orientation needs to be considered as an influencing factor. Furthermore, the present study consisted of only a few users of GHB, whereby the small sample size caused some heterogeneity of variance and may have caused, as mentioned, inflated effect size. In our opinion, this did not jeopardize the findings because additional non-parametric analyses showed an even stronger relationship between sexual behavior and drug use among the users of GHB. However, future research is needed to corroborate these findings. Future research needs also to look further into the differences in perceived and actual sexual thoughts, feelings and behavior between different psychoactive agents within one category of substances (e.g. sedatives). Furthermore, future research could investigate other ways of dividing a patient sample in categories of primary substance of use. In

the present study, the categorization was made according to the perceptions of the patients themselves.

4.2. Implications

Altogether, this study clearly finds a relationship between the use of substances and perceived and actual sexual behaviors among patients with a substance use disorder. This underlines the importance of addressing the relationship in treatment programs, as patients may be hesitant to stop their use of substances when they experience many positive effects in their sexual behavior.

Better understanding of the relationship between substance use and sexual behavior may allow treatment providers to educate patients who experience a strong connection between their substance use and their sexual behavior. In addition, better understanding may promote treatment strategies to be developed to help patients to handle drug-sex related situations during recovery. Furthermore, it seems wise to examine a patient's sexual behavior needs in order to know which specific sexual issues may undermine recovery. The present study indicates that sexuality needs to be addressed within treatment programs. Specifically, treatment interventions need to be developed to help disconnecting the link between substance use and sexual thoughts, feelings and behavior and debilitating the associations between these two, so that they are more manageable to patients. In our opinion, it is important that practitioners acknowledge the relationship between substance use and sexual behavior and address sexuality in order to improve treatment outcomes for patients with substance use disorders.

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