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Towards an Explanation of Subjective Ketamine Experiences among Young Injection Drug Users

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Abstract

Ketamine is a dissociative anesthetic with powerful sedative and hallucinogenic properties. Despite the wide variability in reported subjective experiences, no study has attempted to describe the particular factors that shape these experiences. This manuscript is based upon a sample of 213 young injection drug users recruited in New York, New Orleans, and Los Angeles with histories of ketamine use. Qualitative interviews focused on specific ketamine events, such as first injection of ketamine, most recent injection of ketamine, and most recent experience sniffing ketamine. Findings indicate that six factors impacted both positive and negative ketamine experiences: polydrug use, drug using history, mode of administration, quantity and quality of ketamine, user group, and setting. Most subjective experiences during any given ketamine event were shaped by a combination of these factors. Additionally, subjective ketamine experiences were particularly influenced by a lifestyle characterized by homelessness and traveling.

Keywords

Ketamine; subjective experiences; injection drug use; high-risk youth

Introduction

The subjective experiences associated with recreational ketamine use are diverse and not always easy to describe, particularly in comparison to other illicit substances. Ketamine impacts an array of executive functions, including memory, emotion, language, sensation and perception (Jansen 2001), and produces a range of subjective experiences among users, such as “flying,” “becoming God,” “feeling near death,” or “stuck in a K hole” (Turner 1994; Jansen 2001; Lankenau 2006). Ketamine’s pharmacological properties and the effect of these properties on subjective experiences have been previously described in clinical or experimental settings (Hansen et al. 1988; Parwani et al. 2005; Lofwall et al. 2006). However, no studies have explored other factors influencing or shaping subjective experiences among ketamine users in nonmedical settings. This article examines how six factors shaped subjective ketamine experiences – both positively and negatively – among a sample of young ketamine users. These factors include: polydrug use, drug using history, mode of administration, quantity and quality

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of ketamine, user group, and setting. Significantly, most subjective experiences during any given ketamine event were shaped by two or more factors.

Background

Below, we highlight previous research that has examined how polydrug use, drug using history, mode of administration, quantity and quality of ketamine, user group, and physical setting have influenced subjective experiences for a variety of drugs.

Polydrug use

Polydrug use can negatively impact a drug experience by causing an overdose, particularly when combining heroin and with other substances (Coffin et al. 2003). While mixing heroin and cocaine in a polydrug combination is a long-standing practice (Courtwright 1982), newer populations of polydrug users, such as young people involved in rave/club culture (Measham et al. 2001; Sanders 2006), and new combinations of drugs, such as ketamine mixed with methamphetamine or GHB (Degenhardt et al. 2002), are being reported. While polydrug use can be defined in numerous ways, two important distinctions include simultaneous and sequential polydrug use (Schensul et al. 2005). Simultaneous polydrug use – consuming two or more illicit substances at the same time – and sequential polydrug use (or co-use) – taking two or more illicit substances consecutively in a short time period – may be undertaken to enhance or accelerate a drug high, or moderate a drug experience (Ellinwood et al. 1976; Leri et al. 2003). While polydrug use is often directed towards achieving a particular feeling or experience, ketamine users frequently report negative subjective experiences as a result of polydrug use involving ketamine (Lankenau and Clatts 2005; Sanders et al. in press).

Drug using history

A person's drug using history is likely to impact upon whether a drug experience is viewed as favorable or not. Learning to enjoy the effects of a drug, or having a positive drug experience, is one key part of becoming a regular user (Becker 1953), which is often the starting point for developing a drug history with a particular substance. A user's expectation for a particular drug event, or "set" (Zinberg 1984) is influenced by their history of using a certain substance. A positive set, which may include favorable past experiences with a drug, is more likely to result in a positive drug experience during subsequent events. Given the range of effects associated with ketamine, a person's history of ketamine use – positive, negative, or no prior use – can impact subjective ketamine experiences in important ways (Lankenau 2006).

Mode of administration

Mode of administration is a significant factor impacting subjective drug experience since it determines the rate of absorption into a user's bloodstream, which effects how quickly and how long a drug user feels high (Julien 1992). Common modes of administrating drugs include: injection, e.g., intravenous (IV), intramuscular (IM), or subcutaneous; inhalation into the lungs, e.g., smoking; absorption into mucous membranes, e.g., sniffing; orally, e.g., drinking or swallowing; and rectally. Administering drugs via injection, smoking, or sniffing result in a shorter, more immediate drug experiences whereas, oral or rectal administrations produce a slower, more long-lasting experience (Julien 1992). While different modes of administration can produce different experience regardless of drug type, ketamine is exceptional in the range of experiences linked to mode of administration (Lilly 1978; Jansen 2001; Lankenau 2006). For instance, sniffing ketamine may produce a trance-like euphoria conducive for socializing or dancing whereas, injecting ketamine can result in a deep, catatonic state, often referred to as a "k-hole" (Jansen 2001).

Drug quantity and quality

The quantity of a drug consumed as well as the overall quality of a drug will significantly shape a drug using experience. For instance, ecstasy often varies in the amount of actual MDMA in any one pill, so that users ingesting a pill with a high content of MDMA are likely to have a fundamentally different 'ecstasy experience' than those ingesting a pill containing little to no MDMA (Sanders 2006). As with ecstasy, ketamine is sold in a variety forms, but most commonly as liquid or powder (Jansen 2001; Lankenau and Clatts 2005). Liquid ketamine is typically produced by legitimate pharmaceutical companies and is likely to be of higher quality than powder ketamine, which may contain adulterants. Consuming higher quality or more concentrated ketamine will likely result in a different experience than using weaker forms of the drug.

User group

User groups, such as injection groups or networks of individuals who use drugs together, can provide key resources during a drug event that impact drug experiences. These resources include: knowledge about various modes of administering the drug; drug-using paraphernalia, such as syringes, cookers, or straws; and the quantity and quality of the drug consumed during an event (Lankenau and Clatts 2004). The user group may also impact a person's "set" by creating positive or negative expectations for the drug experience (Zinberg 1984). Ketamine user groups include "ravers" or young people involved in the club/dance settings (Curran and Monaghan 2001; Degenhardt and Topp 2003; Dillon et al. 2003); gay men and men who have sex with men (MSM) (Degenhardt and Topp 2003; Dillon et al. 2003; Rusch et al. 2004); young injection drug users (IDUs) (Lankenau and Clatts 2002; Lankenau et al. 2007); homeless youth (Lankenau and Clatts 2004; Lankenau and Sanders 2007); and workers in the medical field (Ahmed and Petchkovsky 1980; Moore and Bostwick 1999; Jansen 2001). Ketamine using practices, e.g., mode of administration, polydrug use, will be influenced by the expectations, norms, and membership within these groups, which may result in varying subjective experiences across user groups.

Setting

The actual physical space or 'setting' where drug use takes place is another crucial determinant shaping the individual's drug experience (Zinberg 1984). Setting may also refer to the atmosphere within the physical environment (McElrath and McEvoy 2002). For instance, a club constitutes a physical space, but also produces a mood provided by music, lights, and the overall "vibe" of the participants. Both aspects of setting – physical space and atmosphere – may influence a user's drug experience. For instance, the stimulant and hallucinogenic properties associated with ecstasy are enhanced by club environs (Shapiro 1999; Sanders 2006) and may produce an overall positive experience for ecstasy users in these settings. However, other settings may put a damper on a drug experience, such as a car in a parking lot, since such an environment is not conducive to the psychoactive properties of the drug (McElrath and McEvoy 2002). Ketamine has been reportedly used in a range of public and private settings, such as houses, apartments, clubs, raves, music festivals, parks, beaches, streets, and bathrooms (Jansen 2001; Lankenau and Clatts 2004; Lankenau et al. 2007). Each of these settings, with their diverse spatial dimensions and environment properties, offers ketamine users varying degrees of stimulation, comfort and safety, which may influence subjective experiences in different ways.

Methods

Findings are based upon 213 in depth interviews with young IDUs recruited in New York (n = 50), New Orleans (n = 67), and Los Angeles (n = 96) between 2004 and 2006 as part of a study examining health risks associated with injecting ketamine. IDUs were recruited in public

locations in each city, such as parks and street settings, using a combination of targeted sampling (Watters and Biernacki 1989), which focuses sampling on designated neighborhoods and venues known to contain the desired population, and chain referral sampling (Biernacki and Waldorf 1981; Penrod et al. 2003), which utilizes the personal network of a recruited subject to enroll more subjects. In New York, young IDUs were recruited within Manhattan's East Village between April and August 2004. In New Orleans, subjects were recruited primarily within the French Quarter between March 2004 and May 2006. In Los Angeles, IDUs were recruited in Venice, Santa Monica, and Hollywood between January 2005 and June 2006.

Study eligibility was dependent upon meeting two enrollment criteria: being aged between 16 and 29 years old, and having injected ketamine at least once within the past two years. During recruitment, young people were asked a series of screening questions focusing on age, health behaviors, drug use, and homelessness, which ensured that only individuals meeting the enrollment criteria would be invited to participate in the study. Prior to beginning an interview, subjects were offered a description of the study, were encouraged to ask questions about participation, and signed an informed consent document. Subjects received a $20 cash payment in Los Angeles and New York and a $20 drug store voucher[1] in New Orleans as well as referral information for syringe exchanges, drop-in centers, HIV/HCV testing, and drug treatment options. All study procedures were approved by the Institutional Review Boards of participating institutions in Los Angeles, New Orleans and New York.

The interview guide, which consisted of structured, close-ended questions and probing, qualitative questions, was administered by an ethnographer on a laptop computer using Questionnaire Development Software. During each interview, subjects were queried about three ketamine using events: ketamine injection initiation, most recent ketamine injection event, and most recent noninjection event. Subjects were asked to describe various aspects of each event, such as why they used ketamine, how they procured ketamine, and the mode of administrating ketamine. While describing these assorted aspects of each event, subjects often volunteered details on the subjective ketamine experience. Additionally, users were directly asked, "How did that injection of ketamine make you feel?" or "How did sniffing ketamine make you feel?" Follow-up probes focused on particular aspects of the ketamine experience that users described in positive or negative terms. All interviews were digitally recorded and transcribed.

Transcripts were analyzed and coded using ATLAS ti. Overall, users offered three general levels of detail on subjective ketamine experiences: vivid, detailed descriptions; limited, basic descriptions, such as "zombie," "spacey," "relaxed," or "weird;" and no descriptions at all – some simply said the experience was "indescribable." Hence, some transcripts offered rich, contextualized data on subjective experiences while others were of limited use. These more detailed transcripts were coded and analyzed, which revealed six primary domains that shaped or influenced subjective ketamine experiences: polydrug use; drug using history; mode of administration; amount of ketamine consumed; user group; and setting. Excerpted narrative accounts and data summaries are presented to demonstrate how these six primary domains explain whether a user's subjective ketamine experience was positive, negative, or somewhere in between.

Sample characteristics

Since demographic characteristics differed little by recruitment site (Lankenau et al. 2007), a composite sample is reported in Table I. The sample is primarily male, white, heterosexual,

[1]The Institutional Review Boards (IRBs) in Los Angeles and New York allowed cash as an incentive while the IRB in New Orleans recommended the use of grocery store vouchers. The use of cash versus vouchers did not appear to impact sampling or enrollment between sites. See Seddon (2005) for a discussion on the ethics of using cash incentives during research with drug users.

and in their early 20s. A majority of respondents graduated from high school, received a GED, and/or attended a trade school or college. Many reported being homeless at the time of interview, nearly all had a history of homelessness, and many were identified as "travelers," (Hahn et al. 2008; Lankenau et al. forthcoming; Sanders et al. in press) who moved from city to city on a frequent basis in search of new adventures, work opportunities, drugs, and avoiding law enforcement. Many earned income through participating in the informal street economy, which included panhandling, selling drugs, theft, or sex work. Many had been to a drug treatment or a detoxification facility, and a majority had received some type of mental health care, such as psychological therapy. Nearly all had histories of criminal justice involvement, such as an arrest or incarceration in a local jail or state prison. Rates for HIV and HCV testing were high. None reported being HIV positive, yet over one-fifth of those tested for HCV reported being positive.

Table II presents lifetime patterns of ketamine use. Nearly half injected ketamine five or fewer times, while approximately one-fifth injected 21 times or greater. Lifetime patterns of sniffing ketamine were similar, though over one-quarter had sniffed 21 times or more. Injection was the preferred way to administer ketamine with IV modes favored over IM routes. Most had previously mixed ketamine with other drugs in polydrug combinations with cocaine, methamphetamine, and ecstasy being the most common. A small percentage (3.8%) reported ketamine as their "drug of choice," that is, the primary drug (or drugs) used on a regular basis. Rather, heroin, marijuana, alcohol, or methamphetamine were more common drugs of choice.

Findings

In this section, we describe the characteristics that shaped positive and negative subjective experiences during ketamine using events, including polydrug use, drug using history, mode of administration, drug amount, user group, and setting. While one primary characteristic is featured in each section, the accounts presented here indicate that multiple factors typically shaped any given experience.

Polydrug use

For both injection and sniffing events, ketamine was commonly consumed in the context of polydrug use. In many cases, polydrug use was accidental since the opportunity to sniff or inject ketamine occurred unexpectedly after a young person had been using a variety of drugs during the day or evening – a type of sequential polydrug use. At other times, ketamine was intentionally consumed in combination with other drugs to achieve a specific high: either to dampen the effects of a particular substance, such as a stimulant, or to increase the effects produced by other drugs – a type of simultaneous polydrug use. Often, users practiced both sequential and simultaneous polydrug use over the course of a few hours. For instance, Arnold,[2] 24, injected a 50 unit solution of liquid ketamine IV combined with methadone and Xanax. Prior to the event, he had injected four shots of cocaine at his home in Tucson, Arizona. Since he had injected ketamine over 30 times previously, he was experienced with the high and how to modulate it with other drugs:

> It actually worked a lot better with the methadone and the Xanax and also I'd been doing more of it. It made me feel kind of spacey and distant - like being drunk but without the hangover. I guess I passed out for a little bit - probably ten minutes - and came to and had some really good dreams. My friend was kind of worried cause he hadn't seen anyone [pass out] before, but I felt fine when I woke up.

Drugs in powder form, as compared to liquid or tablet form, can more easily be combined into polydrug mixtures. Typical powder mixtures sniffed simultaneously included cocaine and

[2]All names are pseudonyms and ages refer to the person's age at the time of the event described.

ketamine, sometimes referred to as "CK1," or ketamine and multiple stimulants, such as cocaine, methamphetamine, and/or ecstasy, which has been described as "trail mix" (Navarez 2001). For instance, Tony, 22, sniffed a combination of ketamine, cocaine, and methamphetamine at an after-party with several friends following a rave in Houston, Texas. During the rave, he took two tabs of ecstasy while smoking marijuana intermittently. A friend invited him to the after-party who laid out bags of ecstasy, cocaine, methamphetamine, and ketamine on a table. His previous experience mixing ketamine in polydrug combinations and anticipating the different effects produced by each drug resulted in a positive experience:

> I actually mixed coke and speed with the K. He had all three in separate bags so I poured them out on a little mirror, crushed it all up, and made two nice lines. I was fucked up that night. I remember when the K hit me – I was riding that coke and speed high and still tweaking. And then the DJ stepped up and I started dancing.

Ketamine events resulting in the user either seeking or requiring medical attention, which may be loosely defined as an "overdose," often involved pre-existing medical conditions and/or polydrug combinations, specifically the use of a depressant, such as heroin and/or alcohol. For instance, Mickey, 18, was using alcohol, cocaine, and marijuana with his brother in a bedroom at home in a small town in Texas. He injected liquid ketamine IV that he took from his father, whose job involved supplying ketamine to veterinarians. Despite his extensive experience with ketamine – he had injected over 100 times – this most recent injection event resulted in an overdose. His combined use of alcohol, cocaine, and ketamine – along with a medical condition – were most likely contributing factors in the overdose:

> There was a little burning sensation that crept up my arm. I started feeling sick and getting really weak. My stomach got nauseous and really hurt. It was the scariest feeling, and then I fell unconscious, I was incoherent. My brother was there and he called an ambulance. They took me to the hospital, and I had to stay for a week. I'm hypoglycemic so my blood sugar got too low, and the ketamine put me into cardiac arrest.

Users generally reported more positive experiences when using ketamine in the absence of other drugs. Rationales for using ketamine on its own included a desire to experience the drug apart from other intoxicants, reservations about the negative effects associated with injecting drugs in polydrug combinations, or simply not possessing other drugs at the time of ketamine use.

Drug using history

Previous ketamine using events provided users with an experiential framework towards anticipating and understanding the effects of ketamine use. In particular, the expectations for current ketamine events were shaped by whether the individual had mostly positive, mostly negative, or no previous experiences using ketamine. Tolerance for ketamine occurred among persons with extensive histories of use, which impacted subjective experiences. For instance, Megan, 19, self-injected one shot of powder IM, an amount less than she would typically sniff, with her boyfriend in an apartment in Hamilton, Ontario. The somewhat disappointing experience she describes may have been influenced by the relatively small amount of ketamine injected, a tolerance for ketamine, and the expectation for a more intense experience from injecting the drug:

> I was a little disappointed. I felt kind of oozy but not as high as I expected from injecting something – I thought that it would be more intense. The high started from a different area than I was use to. I've done a lot of k [sniffing] but it always started in my head with a gross taste in the back of my throat that I came to associate with getting high. I think I was expecting certain things to happen before the high and then

> those didn't happen. I felt kind of warm and fuzzy - not as disassociated as I'm use to - but it was neat.

As just illustrated, the user's previous experience using ketamine, i.e., sniffing, and expectations as to what might happen during a subsequent injecting event, i.e., "intense," ultimately shaped her interpretation of the event, i.e., "warm," "fuzzy," "neat." Some preferred sniffing ketamine over other modes of administration, since sniffing was viewed as less invasive, required less paraphernalia, and was more effective at consistently achieving a desired high. Having previous experience with all aspects of using ketamine – including less pleasant sensations such as irritated nasal passages –contributed to more positive experiences as indicated by Robert, 22, who had approximately 20 lifetime ketamine sniffing experiences. He used a straw to sniff two lines of powder ketamine, which originally came in capsule form, with five other college students in a home in Greensboro, North Carolina:

> It's got a real bad burn to it. Like just five, ten minutes and it starts burning, then you get the drip. Overall, the effect was pretty much like every other time I sniffed it. That's why I sniffed it – cause I knew what I was gonna get. It's just like a lesser form of than shooting up. I mean, you get a couple spasms and then you start getting tracers and you feel real mellow. I guess mellow is not the word for it. It's kind of out of it, like spacey, like kind of space-hazy – just like we really could give a shit about anything.

Mode of administration

Users reported three primary modes of administrating ketamine – IV, IM, and sniffing – which offered distinct subjective experiences. These three modes also resulted in particular physical sensations – often uncomfortable or painful. For instance, some users described various pains associated with injection, such as a burning sensation in the arm (IV) or a soreness in the muscle (IM). Sniffing ketamine sometimes caused an unpleasant burning sensation or clogged sinuses that prompted some to experiment with injecting ketamine, such as Tommy, 19, who initiated injection drug use with three others in a house in Honolulu, Hawaii, by self-injecting powder ketamine IM. The new sensations associated with injecting ketamine contributed to a positive experience.

> At first I was scared. My heart was beating really fast. And then I could feel it coming on - it was like slow and then it was like "down there." It felt a lot better than when I smoked or sniffed it. It just felt a lot cleaner. I didn't have any cough or any stuffed up nose or anything like that. It just felt like "it's there." It lasted a little bit longer and it just feels a lot better because you have a lot more time to prepare. You can feel it coming in, whereas when you sniffed it, you're waiting and waiting and then all of a sudden, you're almost full throttle. Here, it just slowly came up. I was like 'Okay, I feel like the man.'

As just described, injecting ketamine offered some users a "cleaner" experience – free from uncomfortable physical sensations associated with other modes of administration. Compared to sniffing ketamine, however, injecting ketamine was not without its downsides – especially for those with a relatively shallow history of ketamine use or those not mentally prepared for a profound subjective experience. For instance, one user's account demonstrates the fundamentally different experience offered by injecting ketamine IV compared to sniffing. Lisa, 20, had been injecting heroin and drinking alcohol with three others in a friend's apartment in Utah. While she had sniffed ketamine on a previous occasion, she did not regard it as a particularly powerful drug:

> I was in Salt Lake City with a friend who ended up getting a huge vial of it [ketamine]. I didn't know you could inject it but he was muscle popping it (IM injection]. I was a heroin addict so I was like, "I'm not going to put in my muscle. I'm going to do it

> IV." But, I shouldn't have. Within five seconds of pushing it in I couldn't move at all. I was just laid out on the floor. It almost felt like astral-projection. I felt like I was traveling somewhere but I could still see myself lying on the ground. I kept wondering, looking at myself laying here, "God, I look dead! Am I dead?" And then, I'm talking to myself, "I'm obviously breathing and the fact that I'm having all these thoughts means I'm okay." That lasted for about thirty minutes.

Quantity and quality

During injection events, quantities ranged from 10 units to 100 units (1 cc) per injection and multiple injections during an event were not uncommon. The potency of doses was impacted by whether liquid ketamine from a pharmaceutically-sealed vial (potentially stronger) or a solution of powder ketamine (potentially weaker) were being injected. Some users reported injecting or sniffing particular brands of pharmaceutical-grade ketamine, such as Ketalar, Ketaject, and Ketaset. Some indicated that quality varied by brand, which could impact the ketamine experience. Ingesting the appropriate quantity of ketamine was important for producing the desired effect, yet estimating the proper dose was sometimes difficult – especially if ketamine was being consumed in the midst of a chaotic polydrug using event. For instance, Gloria, 20, sought to "come down" by sniffing ketamine after injecting heroin and smoking crack. She was at her boyfriend's home and split $20 worth of powder ketamine with a female friend. While this was her only lifetime sniffing event, she believed she needed to sniff twice the amount of ketamine typically injected to have the same experience:

> We sat there holding hands thinking we were going to die. She kept saying, "I can't move! I can't move!" And I said "You're gonna be fine" and then I started feeling the same way. It took me a little bit longer than her [to feel the effects] cause she's a small girl. So she said she was gonna die and she didn't think she was gonna make it through the night. And I kind of enjoyed the feeling of almost dying. It was kind of a rush for me.

During injection events, young people were not always aware of either the quantity or potency of ketamine being injected. For instance, syringes were sometimes filled by others within the injection group, which could leave the user unprepared for the experience to follow. Occasionally, users attempted to control the subjective experience by manipulating the quantity of ketamine injected, such as injecting IM followed immediately by an IV injection. The rationale for this particular sequence is to provide a longer lasting high by first injecting IM, whereby ketamine is slowly absorbed into the bloodstream, followed by an IV injection to gain an immediate high. For instance, Alison, 26, self-injected liquid ketamine twice – first an IM injection followed by an IV injection. The event took place in an alley in Cincinnati, OH, with an ex-boyfriend and two other friends. While she was a relatively experienced ketamine injector, the back-to-back injections produced a particularly powerful effect:

> We did 20 units in our muscle and then right after that, pretty much instantly, we did another one [20 units] in our arm [IV]. I basically felt "stuck". I did a lot more that time than I usually do. The K-hole probably lasted a little longer. I just kind of laid on the ground. I couldn't really move, everything was real slow, everybody was talking real slow. It was pretty intense that time since we did so much of it.

User group

Members of the user group often had particular preferences for administering ketamine, such as sniffing or injecting IV, which resulted in different experiences. Using ketamine in a manner that is agreeable to all members of the user group can enhance the subjective experience. In particular, a positive experience may be cultivated by using ketamine with certain individuals who share similar sentiments towards using ketamine. For instance, Donna, 18, sniffed

approximately two grams of powder ketamine in a bathroom with her friend at a bar in Washington, DC. Earlier that day, she had injected liquid ketamine IM with the same female friend. She had over 50 lifetime sniffing experiences, suggesting that she enjoyed the experience associated with sniffing ketamine:

> I just felt kinda loose and happy and didn't give a fuck about anything. I felt really happy cause that girl that I was doing it with was my best friend and we did it all the time together. It was kind of like "our thing". It wasn't the only thing we had in common, but we enjoyed doing it together. We'd do it with other people, but we really liked being with each other when we were on it.

IDUs with experience injecting a variety of drugs were often initially inclined to inject ketamine IV – just as they had previously injected heroin, cocaine, or methamphetamine. However, these IDUs were sometimes exposed to the practice of injecting ketamine IM within the injection group, which influenced their own mode of administration. For instance, Jim, 21, injected powder ketamine IM with his girlfriend, who both supplied the drug and introduced him to the practice of injecting ketamine. While he was an experienced IDU, his girlfriend both prepared the powder ketamine and administered two injections each containing 10 units of ketamine under an overpass in Hollywood, CA. Earlier in the day, he had been smoking marijuana and injecting methamphetamine.

> She [girlfriend] taught me how to do it. She said that I didn't want to do it in my vein - like how I regularly shot-up speed [methamphetamine]. You can overdose on a very minimal amount. So, I did two shots [IM] that time. After the first shot, I was like, "I don't feel anything. I'm not high." So she did me again, and then I was tripping. I was like, "Whoa."

Setting

Users described a range of indoor settings for sniffing or injecting ketamine, such as house parties, raves, bathrooms, and apartments, as well as outdoor settings, such as streets, beaches, parks, and music festivals. As with the social influences associated with a user group, the physical setting of a ketamine event positively or negatively influenced the user's subjective experience. Given the particular sensory properties associated with ketamine, a novel or new setting may enhance a subjective experience. For instance, Phil, 20, injected one shot of ketamine IM with three others in a small town in New York during a snow storm. He had sniffed and injected ketamine on previous occasions and was familiar with its effects:

> I had never really seen snow and it was around Christmas time and it was snowing really heavy. I wanted to lay in the snow in a K-hole watching it snow. I wasn't cold when I went outside. And I could feel everything slowing down. And when I laid in the snow bank, I looked up and the snow was just coming in like one big thing. I just layed out in the snow. I even made a snow angel. It made me feel really warm. I kind of liked it that time. The first time I did it, I wasn't freaked, but it was new to me. This time it was kind of cool - just to lay in the snow and make a snow angel and watch the snow coming down.

Settings were frequently important towards facilitating the acquisition of ketamine. For instance, traveling from city to city, going to music festivals or raves, and being in public places put the young people in settings where they met new people who possessed drugs they might not have encountered otherwise. In particular, the lifestyle associated with being homeless opened some to new drug experiences, such as experimenting with ketamine. Hence, a setting could serve both as a location to acquire ketamine and a place to enhance the drug experience depending upon the individuals and their surroundings. For instance, Teri, 19, received free liquid ketamine at a rave in Hollywood, which she injected IM with a male friend, while being

homeless. The positive experience she describes is linked to injecting a modest amount of ketamine while also being located in a setting conducive to using ketamine:

> I didn't know I was going to be doing K at all. I was at a rave, and it was the same [as previous injection], but different. I didn't do as much [ketamine] so I didn't go into a K-hole. I had more fun. The music got louder and I had visuals – a lot of traces. It was like everything was a Japanime cartoon. We danced, we partied, and everything was touchy-feely.

Conclusion

This manuscript illustrates how subjective ketamine experiences among a sample of young, primarily white homeless IDUs, were shaped by six identifiable characteristics: polydrug use; drug using history; mode of administration; drug quantity and quality; user group; and physical setting. Other researchers have found these characteristics have shaped the subjective experiences of drug use for various substances and disparate groups of users (e.g., Becker 1954; Zinberg 1984; Shapiro 1999; McElrath and McEvoy 2002). Often, a combination of these factors was evident in the more detailed accounts of ketamine experiences described by the sample. Rather than static and isolated, these characteristics were fluid and interwoven, shaping ketamine experiences for users in both positive and negative ways.

Positive ketamine experiences were generally characterized by two or more of the following user or event attributes: minimal mixing with other drugs, particularly opioids and depressants; planning polydrug combinations so that ketamine was used sequentially or simultaneously with other drugs in small or moderate amounts; more extensive histories using ketamine and/or hallucinogens; greater experience administering drugs in a variety of manners, such as sniffing, IV, or IM; knowing the quantity and quality of ketamine consumed; using ketamine within a group of trusted, experienced users; and using ketamine in a relaxing or stimulating setting.

Negative experiences were often characterized by the absence of two or more of these features found during positive events. In particular, negative experiences were commonly characterized by using too much ketamine (quantity) and/or using ketamine in the context of polydrug use, such as with alcohol or opioids. Since ketamine was not a common drug of choice and many IDUs did not have extensive histories using ketamine, most were less experienced with ketamine compared to many other illicit drugs. This lack of knowledge may have contributed to using more ketamine than intended in some instances or not being aware of the complications of combining ketamine with other drugs.

These six factors were interrelated in ways that either directly or indirectly influenced subjective experiences among this sample of ketamine users. Certain public settings where ketamine use occurred, such as streets, parks, raves, and music festivals, often involved user groups characterized by extensive histories of drug use, homelessness, and geographic mobility. Users within these settings were open to experimenting with a variety of drugs, which frequently resulted in polydrug combinations – often because ketamine use occurred unexpectedly within these settings. Since ketamine was primarily procured for free, the quantity and quality of ketamine consumed during events was frequently outside of the user's control. Most were knowledgeable IDUs with the skills and expertise to administer ketamine in several ways resulting in various experiences. Ultimately, subjective ketamine experiences were particularly influenced by a lifestyle characterized by homelessness and traveling.

This analysis is limited by the fact that all descriptions of ketamine experiences were self-report and may be influenced by social desirability bias and problems of memory or recall. Additionally, the sample is a rather particular group of ketamine users: enrollment criteria were restricted by age and to those with a history of injecting ketamine. Also, our sample had a

significant history of drug use, involvement in the criminal justice system, and homelessness. The characteristics shaping ketamine use among a lower risk, more geographically stable sample of ketamine users may vary significantly. Nonetheless, our findings may serve as a heuristic model to inform future studies seeking to examine subjective experiences on ketamine or other drug use.

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References

Ahmed SN, Petchkovsky L. Abuse of ketamine. British Journal of Psychiatry 1980;37:303. [PubMed: 7437669]

Becker H. Becoming a marijuana user. American Journal of Sociology 1953;59:235–242.

Biernacki P, Waldorf D. Snowball sampling: Problems and techniques of chain referral sampling. Sociological Methods and Research 1981;10:141–163.

Coffin P, Galea S, Ahern J, Leon A, Vlahov D, Tardiff K. Opiates, cocaine and alcohol combinations in accidental drug overdose deaths in New York City 2003;98(6):739–747.

Copeland J, Dillon P. The health and psycho-social consequences of ketamine use. International Journal of Drug Policy 2005;16:122–131.

Courtwright, DT. Dark paradise: Opiate addiction in America before 1940. London, England: Harvard University Press; 1982.

Curran V, Monaghan L. In and out of the K-hole: A comparison of the acute and residual effects of ketamine in frequent and infrequent ketamine users. Addiction 2001;96:749–760. [PubMed: 11331033]

Degenhardt L, Darke S, Dillon P. GHB use among Australians: Characteristics use patterns and associated harm. Drug and Alcohol Dependence 2002;67:89–94. [PubMed: 12062782]

Degenhardt L, Topp L. 'Crystal meth' use among polydrug users in Sydney's dance party subculture: Characteristics, use patterns and associated harms. International Journal of Drug Policy 2003;14:17–24.

Dillon P, Copeland J, Jansen K. Patterns of use and harms associated with non-medical ketamine use. Drug and Alcohol Dependence 2003;69:23–28. [PubMed: 12536063]

Ellinwood EHJ, Eibergen RD, Kilbey MM. Stimulants: Interaction with clinically relevant drugs. Annals of the New York Academy of Sciences 1976;281:393–408. [PubMed: 14585]

Hahn JA, Page-Shafer K, Ford J, Paciorek A, Lum PJ. Traveling young injection drug users at high risk for acquisition and transmission of viral infections. Drug and Alcohol Dependence 2008;93:43–50. [PubMed: 17980513]

Hansen G, Jensen SB, Chandresh L, Hilden T. The psychotropic effect of ketamine. Journal of Psychoactive Drugs 1988;20(4):419–425. [PubMed: 3244062]

Jansen, K. Ketamine: Dreams and realities. Sarasota, FL: Multidisciplinary Association for Psychedelic Studies; 2001.

Julien, RM. A primer of drug action: A concise, nontechnical guide to the actions, uses and side effects of psychoactive drugs. 6. New York: W.H. Freeman and Company; 1992.

Lankenau, S. On ketamine: In and out of the K hole. In: Sanders, B., editor. Drugs, clubs and young people: Sociological and public health perspectives. Aldershot. UK: Ashgate Publishers; 2006. p. 77-87.

Lankenau S, Clatts M. Ketamine injection among high risk youth: Preliminary findings from New York city. The Journal of Drug Issues 2002;32(3):893–905.

Lankenau S, Clatts M. Drug injection practices among high-risk youth: The first shot of ketamine. Journal of Urban Health 2004;81(2):232–248. [PubMed: 15136657]

Lankenau S, Clatts M. Patterns of polydrug use among ketamine injectors in New York City. Substance Use and Misuse 2005;40:1381–1397. [PubMed: 16048823]

Lankenau S, Sanders B. Patterns and frequencies of ketamine injection in New York City. Journal of Psychoactive Drugs 2007;39(1):21–29. [PubMed: 17523582]

Lankenau S, Sanders B, Jackson Bloom J, Hathazi D, Alarcon E, Tortu S, Clatts M. First injection of ketamine among young injection drug users (IDUs) in three U.S. cities. Drug and Alcohol Dependence 2007;87:183–193. [PubMed: 16979848]

Lankenau, S.; Sanders, B.; Jackson Bloom, J.; Hathazi, D.; Alarcon, E.; Tortu, S.; Clatts, M. Migration patterns and substance use among young homeless travelers. In: Thomas, Y., editor. Geography and drug addiction. Guilford, UK: Springer Press; in press(forthcoming)

Leri F, Bruneau J, Stewart J. Understanding polydrug use: Review of heroin and cocaine co-use. Addiction 2003;98:7–22. [PubMed: 12492751]

Lilly, JC. The scientist: A novel autobiography. New York: J.B. Lippincott; 1978.

Lofwall MR, Griffiths RR, Mintzer MZ. Cognitive and subjective acute dose effects of intramuscular ketamine in healthy adults. Experimental and clinical Psychopharmacology 2006;14(4):439–449. [PubMed: 17115871]

McElrath K, McEvoy K. Negative experiences on ecstasy: The role of drug, set and setting. Journal of Psychoactive Drugs 2002;34(2):199–208. [PubMed: 12691210]

Measham, F.; Aldridge, J.; Parker, H. Dancing on drugs: Risk, health and hedonism in the British club scene. London: Free Association Books; 2001.

Moore NN, Bostwick JM. Ketamine dependence in anesthesia providers. Psychosomatics 1999;40(4): 356–359. [PubMed: 10402883]

Navarez, R. MDMA in combination: ‘trail mix’ and other powdered drug combinations. paper presented at MDMA/Ecstasy Research: Advances, Challenges, Future; Bethesda. 19–20 July; 2001.

Parwani A, Weiler MA, Blaxton TA, Warfel D, Hardin Frey K, Lahti AC. The effects of a subanesthetic dose of ketamine on verbal memory in normal volunteers. Psychopharmacology 2005;183:265–274. [PubMed: 16220331]

Penrod J, Preston DB, Cain RE, Starks MT. A discussion of chain referral as a method for sampling hard-to-reach populations. Journal of Transcultural Nursing 2003;14:100–107. [PubMed: 12772618]

Rusch M, Lampinen TM, Schilder A, Hogg RS. Unprotected anal intercourse associated with recreational drug use among young men who have sex with men depends on partner type and intercourse role. Sexually Transmitted Disease 2004;31(8):492–498.

Sanders, B. Young people, clubs and drugs. In: Sanders, B., editor. Drugs, clubs and young people: Sociological and public health perspectives. Aldershot, UK: Ashgate; 2006.

Sanders B, Lankenau S, Jackson Bloom J, Hathazi D. Multiple drug use and polydrug use amongst homeless traveling youths. Journal of Ethnicity in Substance Abuse. in press

Schensul JJ, Convey M, Burkholder G. Challenges in measuring concurrency, agency and intentionally in polydrug research. Addictive Behaviors 2005;30:571–574. [PubMed: 15718073]

Seddon T. Paying drug users to take part in research: Justice, human rights and business perspectives on the use of incentive payments. Addiction Research and Theory 2005;13(2):101–109.

Shapiro, H. Dances with drugs: Pop music, drugs and youth culture. In: South, N., editor. Drugs: cultures, controls and everyday life. London: Sage; 1999. p. 17-35.

Turner, DM. The essential guide to psychedelics. San Francisco: Panther Press; 1994.

Watters J, Biernacki P. Targeted sampling: Options for the study of hidden populations. Social Problems 1989;36(4):416–430.

Zinberg, N. Drug, set, and setting. New Haven: Yale University Press; 1984.

Table I

Demographic characteristics (N = 213).

Median age	22
Male	68.1%
Race and ethnicity	
White/Caucasian	74.2%
Black/African American	0.5%
Hispanic/Latino	6.6%
Asian or Pacific Islander	0.5%
Native American	0.9%
Multiracial background	16.0%
Sexual identity	
Heterosexual	77.0%
Gay/Lesbian	1.4%
Bisexual	18.8%
Other/Undecided	4.2%
High school graduate or GED	61.9%
Homeless	79.8%
Homeless traveler	61.5%
Ever homeless	99.1%
Employed full or part time	30.0%
History of drug treatment	53.1%
History of mental health care	72.3%
Ever arrested	92.0%
Ever in jail	85.4%
Ever in prison	14.6%
Tested for HIV	91.5%
HIV positive[a]	—
Tested for HCV	83.6%
HCV positive[b]	19.7%

[a] Notes: Self reported.

[b] Of respondents reporting multiracial ancestry (n = 34): White/Caucasian 85.3%, Black/African American 11.8%, Hispanic/Latino 35.3%, Asian or Pacific Islander 8.8%, Native American 29.4%, Creole: 2.9.

Table II

Patterns of ketamine use (N = 213).

Lifetime ketamine injection[a]	
1–5	47.3%
6–20	30.7%
21+	21.0%
Lifetime ketamine sniffing[a]	
0–5	51.3%
6–20	21.0%
21+	26.4%
Preferred way to use ketamine[b]	
Intravenous (IV)	41.0%
Intramuscular (IM)	28.7%
Intranasal (sniffed)	26.6%
Other	7.8%
Combined ketamine w/other drugs (Ever)	45.1%
Cocaine	19.2%
Methamphetamine	11.3%
Ecstasy	11.3%
Heroin	8.0%
Marijuana	6.6%
LSD	5.2%
Drug of choice (ketamine)	3.8%

[a] Note: Eight respondents missing data;

[b] Twenty-five respondents missing data.