Applied Cardiopulmonary Pathophysiology 16: 309-321, 2012

Ecstatic anaesthesia: Ketamine and GHB between medical use and self-experimentation

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Abstract

Today, the medical usefulness of mind-altering drugs such as ketamine and gamma-hydroxybutyrate (GHB) is often contested by their bad reputation as 'club drugs'. However, both drugs exert a unique spectrum of subjective and neurobiological effects which are valued for medical and recreational use alike. The meaning of the mind-altering effects of ketamine and GHB in clinical experiments versus recreational settings has not yet been subject of qualitative research. This review of biomedical studies with ketamine and GHB and a qualitative content analysis of self-reports about illicit drug use published on the online-platform Erowid aim at shedding light on the intentions and meanings of clinical and recreational use, with a focus on self-experimentation and self-medication. The analysis revealed divergent effects of ketamine and GHB in medical experiments on the one hand and self-experimental use on the other. The characteristic subjective effects of both drugs differ according to set and setting variables. Clinicians and recreational users have comparable motivations concerning the relief of individual suffering such as depression, anxiety and addiction. The results support further sociological and medical research on the curative effects of ketamine and GHB in settings different to nightlife environments.

Key words: ketamine, gamma-hydroxybutyrate, GHB, subjective experience, recreational use, drug, date rape, anaesthetic, antidepressant, Erowid, medical value

1 Introduction

Many of the drugs that are used for recreational purposes today originate from pharmaceutical laboratories and clinical settings. In this regard, ketamine and gamma-hydroxybutyrate (GHB) are of special interest, as they exert a unique spectrum of subjective and neurobiological effects, valued for medical and recreational use alike. While clinicians conduct experiments for better understanding and treating mental disorders, recreational users make self-experimental use of the same drugs in order to explore altered states of consciousness. Thus, the 'meaning of high' for ketamine and GHB may be ascertained by an amalgamation of the perspectives of the medical profession on one hand and of recreational users on the other. In this chapter, an overview of the history of both the medical and recreational uses of ketamine and GHB and of their psychopharmacological effects is given. This is then illustrated by an analysis of recreational user reports from the internet platform Erowid, with a focus on self-experimentation and self-medication. Finally, results, similarities and differences of the drugs' effects, set and setting variables are summarised.

2 History of medical and illicit use of ketamine and GHB

The timeline of the development of the medical and illicit use of ketamine and GHB is illustrated by Figure 1.

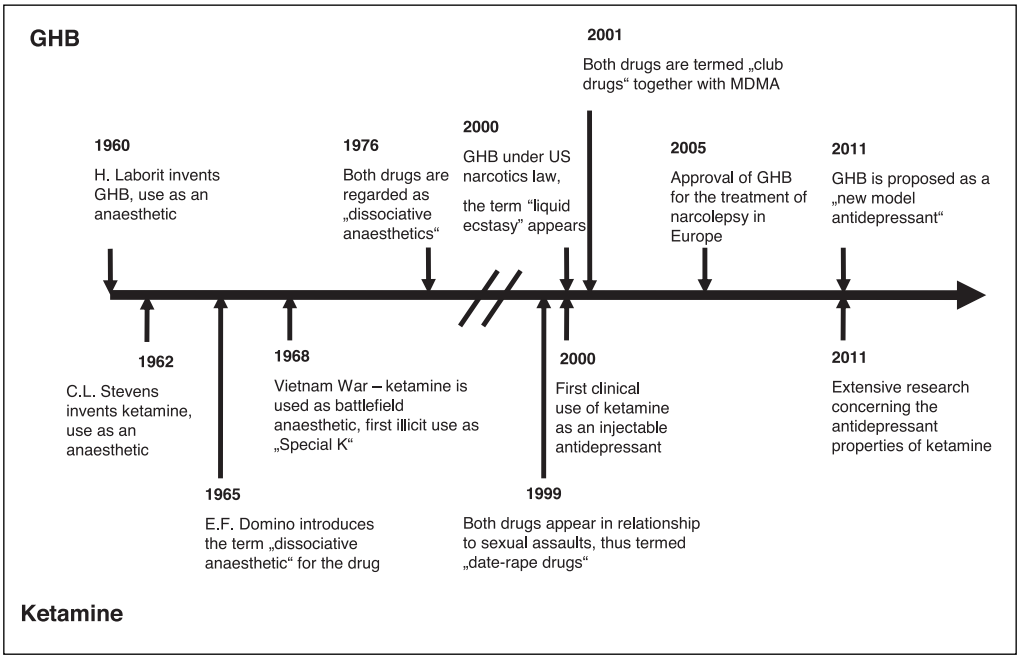

Figure 1: Timeline of medical and illicit use of GHB and ketamine.

Ketamine

Ketamine was synthesised in 1962 by C. L. Stevens, who was searching for a short-acting PCP derivate. The substance was first tested in humans in 1964 in prison and subsequently used as an anaesthetic (Domino et al., 1965). It was also being used outside of the hospital and laboratory settings as early as 1967 in the United States, where it was made available under the names of ‘mean green’ or ‘rockmesc’ (rock mescaline) by ‘medical chemists’ from Michigan (Jansen, 2004). The association of ketamine with mescaline – the active alkaloid of the peyote cactus – indicates that it was used because of its psychoactive properties. In the 1970s, the Vietnam War increased the needs for physiologically safe battlefield anaesthetics that are easy to handle. Ketamine was a strong candidate for such purpose, since – unlike most available anaesthetics – it only slightly interferes with vital parameters (e.g. blood pressure) and does not induce respiratory depression in therapeutic doses (Mercer, 2009). At the same time, the recreational use of drugs among soldiers in Vietnam reached epidemic proportions (Brush, 2002). It has been suggested that these Vietnam veterans were responsible for introducing a new outlook on anaesthetics into their home communities, thus contributing to the further spread of ketamine as a recreational and self-experimental drug (Jansen, 2004). During this time, ketamine was also established as a common anaesthetic for surgery, emergency, paediatric and veterinary medicine, but its use in adult surgery declined due to the drug’s dissociative and hallucinogenic effects (as discussed below). However, its easy and cheap production has enabled its spread all over the world, making ketamine one of the most frequently used anaesthetics in developing countries today (Green et al., 1996).

According to the central source of comprehensive information on the European drug situation, the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), public awareness about illicit ketamine use in Europe was not raised until the

1990s, when the drug surfaced in recreational settings (EMCDDA, 2002). Ketamine gained popularity in Europe with the advent of techno raves (Jansen, 2004). In the 1990s, the dance culture movement in Europe began to grow rapidly into a mainstream enterprise, with famous DJs and drawing huge crowds. Ketamine was part of these raves from the start (Jansen, 2004). As the drug moved into the mainstream, the number of reports of intoxications with the drug also increased: the London Centre of the National Poisons Information Service reported a 10-fold increase in registered cases of ketamine intoxications in the UK from 1995-2001 (Home Office, 2004). Despite ketamine's good safety profile in medical settings, non-medical intake entails a number of health risks, especially when used in public spaces. In lower doses, ketamine can produce a state of dissociation resulting in disorientation, and, in higher doses, a complete loss of consciousness. Such states can lead to serious injuries, particularly when experienced in a club or another unprotected setting (Jansen, 2004). The increase in usage and accidents resulting from ketamine overdoses finally led to stricter monitoring and legal control in most European countries (EMCDDA, 2002).

In Europe, there are limited data available on prevalence of ketamine use. The EMCDDA suggest that its use has stabilised at low levels in most countries and the prevalence of ketamine use in the general adult and school populations is estimated to be much lower than for the use of cocaine and ecstasy. Surveys targeting specific populations such as partygoers, however, suggest a higher range for lifetime use of between 29 and 62 percent (EMCDDA, 2011).

In contrast to the stricter legal controls of illicit ketamine use, a clinical resurgence of ketamine research has taken place over the past decade. Based on early attempts to use the drug for the treatment of depression, especially in a 'psycholytic' context, wherein the intention is to reveal unconscious material with the help of mind-altering drugs (Sofia & Harakal, 1975), the first modern psychopharmacological study of ketamine in patients with treatment-resistant major depression was published in 2000. The study revealed ketamine to be a fast and robust antidepressant (Berman et al., 2000). Later case studies had similar results, and randomised trials of ketamine in patients suffering from depression also confirmed previous studies. This led to extensive international research on the role of ketamine for the treatment of depression (Covvey et al., 2012).

GHB

GHB was originally invented by Henri Laborit in 1961 to be an orally active GABA (gamma amino butyric acid) analogue (Laborit et al., 1960). Laborit is celebrated as the 'father of psychopharmacology' for his discovery of the first antipsychotic chlorpromazine. However, in most accounts of Laborit's achievements, GHB is not mentioned, although he expressed the opinion that chlorpromazine was trivial compared to GHB (Mamelak, personal communication). Like ketamine, GHB was first used in a medical context as an anaesthetic prior to surgical proceedings and it is still licensed and used for such purposes in Germany. In the 1960s, it was also successfully tested as a tranquiliser and antidepressant in psychiatric patients, but the rise of the benzodiazepines and tricyclic antidepressants squeezed GHB off the psychiatric agenda (Rinaldi et al., 1967). GHB was also examined as a dream-facilitating agent for antidepressive therapy (Appia, 1967). In the 1970s, Mortimer Mamelak discovered GHB's unique effects on the sleep-wake rhythms, which led to its development as a standard treatment for narcolepsy.

In the 1980s, the drug achieved popularity among recreational users and as a nutritional supplement in fitness clubs and health centres. It was used by bodybuilders and health advocates for its renowned anabolic properties and capacity to increase slow-wave sleep (Bosch et al., 2012). GHB has also been sold in sex shops as an aphrodisiac

to enhance sexual arousal and performance (Romanelli et al., 2003). In the 1990s, GHB appeared as a club drug in Europe, promising effects similar to those of alcohol (EMCDDA, 2008). Soon after, concerns arose about GHB's potential to facilitate sexual assault through the 'spiking' of drinks in clubs. GHB's association with amnesia, combined with the fact that it clears quickly from the body, makes it a difficult drug to detect in the event of sexual assault (Nemeth et al., 2010). Even so, according to the EMCDDA (2008), alcohol remains the drug most often used in sexual assault (EMCDDA, 2008).

In March 2001, GHB was added to Schedule IV of the 1971 United Nations Convention on Psychotropic Substances, binding all European Union Member States to control it through legislation addressing psychotropic substances. Data by the EMCDDA shows that prevalence of GHB is relatively low, even taking into account that most studies also record the use of its precursors, GBL (g-Butyrolacton) and 1,4-butanediol (1,4-BD). When ingested, these precursers are rapidly converted to GHB and produce effects that are almost identical to those of GHB. Thus, it can be assumed that whilst respondents in surveys may report that they have used GHB, they may in fact have used GBL. In 2003, data collected in the schools of 25 European countries indicated that GHB/GBL has been tried by a very small proportion of 15-16 year olds (between 0.5 % and 1.4 %) (EMCDDA, 2008). Nevertheless, the EMCDDA estimates the use of GHB to be higher in specific populations, settings and regions of Europe. Surveys conducted in dance music settings report lifetime use of GHB/GBL ranging from 3 % to 19 %. Other studies in targeted populations across European countries report a slightly lower lifetime prevalence, ranging from 3.9 % to 14.3 %, and last month prevalence of up to 4.6 % (EMCDDA, 2011).

Despite the classification of GHB as a controlled substance, the drug was licensed for the treatment of narcolepsy in the United States in 2002 and in Europe in 2005. Moreover, it is licensed in Austria and Italy for the treatment of alcohol withdrawal. Because of its unique effects on mood, circadian rhythms and neuroendocrine regulation, GHB was recently proposed for use as an antidepressant (Bosch et al., 2012).

3 Psychopharmacology of ketamine and GHB

Ketamine

Ketamine mainly acts by inhibiting the glutamatergic system, which is the principal activating neurotransmitter system of the brain. The substance has an antagonist effect on N-Methyl-D-aspartate (NMDA) receptors, leading to an inhibition of glutamatergic transmission (Anis et al., 1983). The drug is termed a 'dissociative anaesthetic', which means it has the capacity to induce narcosis and narcosis-like states in which the consciousness appears to be separated from the body (Domino et al., 1965).

In a study of ten healthy volunteers, ketamine (20 mg initial bolus i.v., followed by 0.02-0.03 mg/kg/min infusion over 60 min) produced acute depersonalisation and derealisation phenomena, visual disturbances, thought disorders and apathy. Visual disturbances varied from pseudohallucinations to elementary and complex hallucinations. Environmental sounds were reported to influence thought content and subjective experiences. Affect of the subjects flattened, and most of them lost interest in the experimental setting and withdrew emotionally: directed attention and thinking became difficult for them. Mood rating showed emotional deactivation, introversion, negative feelings and anxiety. All subjects reported distortion of body-image, loosening of ego-boundaries, and alterations of the sense of time and space. All these phenomena were associated with emotional experiences ranging from heightened feelings and euphoria (30%), to indifference (30%) and anxiety (30%). These subjective effects correlated with increased

cerebral activity in the frontal cortex (Vollenweider et al., 1997). It is interesting that a high incidence of negative feelings and anxiety was reported in this study sample, as this coincides with reports from emergency medicine and surgery, where ketamine has regularly been reported to induce bad dreams, visions of death and anxiety (Engelhardt, 1997). Several studies have investigated set and setting effects on the emergence reaction (i.e. awaking from narcosis) after ketamine narcosis.

The occurrence of hallucinations and dreams seems to be related to an individual's development of visual imagination and literacy. In a study with patients from a Pathan (from the Pakistan border with Afghanistan) rural population sample undergoing surgical operations, only 0.63% of the illiterate patients showed hallucinatory emergence phenomena, as opposed to 40% of the literate patients (Currie & Currie, 1984). In another study, most patients who experienced hallucinations and dreams in the recovery room also regularly dreamed at home, while those who did not dream at home displayed only a low occurrence of emergence phenomena (Hejja & Galloon, 1975). Apart from individual predispositions (e.g. set), setting variables strongly interfere with the ketamine-induced experiences in medical environments. For example, the pleasantness and acceptance of ketamine narcosis was higher in gynaecological patients when music was played pre- and postoperatively, although the incidence of emergence reactions remained unchanged (Kumar et al., 1992). While pharmacological interventions (e.g. tranquilisers) demonstrated only limited success in modifying ketamine emergence reactions, supportive psychological interventions lowered adverse psychic reactions in patients undergoing surgical operations (Sklar et al., 1981).

GHB

GHB is a breakdown product of the main inhibiting neurotransmitter of the brain, gamma amino butyric acid (GABA). The drug mainly acts as an agonist on the subtype B of GABA receptors, leading to a widespread inhibition of cerebral activity. Furthermore, it acts on a variety of other neurotransmitter systems such as the dopaminergic, the norepinephrinergic, and the cholinergic as well as possibly the opioid system. GHB is a molecule which is physiologically produced by the body, including specific GHB receptors which also occur in the brain. Therefore, GHB is considered to be a putative neurotransmitter. In humans, exogenous GHB shows mixed stimulant-sedative qualities with a broad spectrum of effects ranging from mild euphoria and relaxation at low doses (10 mg/kg), over-prosocial and prosexual activity, to deep sleep and coma in higher doses (30-50 mg/kg) (Abanades et al., 2006; Bosch et al., 2012). Early studies with psychiatric patients and healthy volunteers demonstrated the sleep-inducing and tranquilising effects of GHB, reporting an immediate and sudden awakening after its effect wore off and an absence of hangover effects, which are seen in comparably potent sedating agents (Delay et al., 1965). Moreover, the prosexual or 'aphrodisiacal' effects of GHB were noticed in these early studies (Laborit, 1971). The prosocial effects of GHB were also explicitly mentioned in the first psychiatric studies, as the therapeutic alliance between patients and psychiatrists was facilitated and intensified by the drug (Ducouedic et al., 1964).

In a qualitative focus group study, 51 recreational GHB users were questioned about their consumption habits, experiences and beliefs concerning the drug. Participants reported predominantly infrequent use (less than once a week) in private or club settings. The main subjective effects were euphoria, relaxation, disinhibition, increased sexual arousal and desire, as well as enhanced tactile sensations, mood and sociability. Most subjects were aware of the risks of GHB use, especially when combined with alcohol or in relation to addiction (Barker et al., 2007). In an online survey (n = 189), GHB users reported their main reasons for use: recreation-

al purposes (18.3%), enhancing of sex (18.3%) and sociability (13.1%), and exploration of altered states of consciousness (13.1%) (Sumnall et al., 2008).

4 Erowid ketamine and GHB user reports

We performed a qualitative analysis of user reports about ketamine and GHB that were published on Erowid, a widely used internet-based library about psychotropic drugs, which includes scientific publications as well as drug experience reports from the general public. A total of 60 of these user reports (see tables 1 and 2) about GHB (n = 28) and ketamine (n = 32) were analysed, using a grid with topics on drug, set and settings of use, subjective effects, and addiction. Topics were selected on the basis of the drugs' effects described in the biomedical literature. The grid included categories such as gender, setting (club or other setting), intention of usage (self-experimentation, party intention, enjoyment, self-medication, doping), risks of use (overdosing, unwanted toxic effect, 'bad trips', withdrawal/addiction) and other subjective experiences such as hallucinations, revelations, empathogenesis, euphoria and sensuality. The Erowid website provides access to 144 user reports about GHB and 278 reports about ketamine. The authors read all those published between 2000 and 2011, looking for the lines of debate and opinions listed in the grid. Only reports containing relevant and more elaborated information were selected. Given that full discrimination of mono- from polydrug effects is not possible, user reports which refer to polydrug use were rejected.

Drug

Injecting and nasal drug use of ketamine were equally reported (13 users report injecting intramuscularly, two intravenously, and 15 report nasal intake of ketamine). Four out of eight female ketamine users report having injected the drug (reports 05, 07, 27, 34) and one states oral administration (report 10). All GHB users report oral administration of the drug in liquid form. Ketamine dosage ranged between 45-100 mg for intravenous injection, 50-300 mg for intramuscular injection, and 100-1,000 mg for intranasal application. GHB dosage ranged between one and eight grams for each session, while daily dosages up to 40 g were reported in repeated dosing.

Set

Of the 34 reports about ketamine experiences, 25 were published by male drug users and seven by females. 18 of the 28 GHB reports were written by male drug users and seven by females. Most had previously used other drugs and report that they had used ketamine and GHB because they were curious about trying out another substance. In particular, ketamine users tend to describe their interest in the drug as a form of mental or psychedelic self-experimentation. Mental travelling close to a loss of consciousness, the so-called 'k-hole', is often reported as an aim of ketamine use and regarded as a focal point for a psychedelic experience (reports 01, 03, 55, 58): 'My intention was to experience the k-hole and see whether I would experience something similar to an out-of-body-experience and immersion into strange other realities' (report 01). There are no GHB users who say that they took the drug with the intention of losing consciousness. Some drug users describe their motivation for using GHB or ketamine as self-medication. According to these user reports, the drugs are mostly used (illicitly) with the intention of treating anxiety (GHB), depressed mood episodes (ketamine and to lesser degree GHB) and sleep disturbances (ketamine and GHB).

Ketamine and GHB are often reported to be taken illicitly with the intention of treating sleeping disorders or, in the case of GHB, to improve sleeping at night (reports 02, 03, 07, 13, 14, 36, 47). A few users report that they took GHB as an alcohol substitute, because

Table 1: Erowid reports on ketamine.

Report No.	Year	Title (Erowid ID)
01	2011	Amazing First-time Experience in the K-hole (90988)
02	2002	Too Much, Too Fast (8884)
03	2009	First K-hole – The True Horror Behind Reality (78894)
04	2004	Breaking New Barriers (29845)
05	2002	Field of Consciousness (14967)
06	2002	Ketamine Health Problems (4808)
07	2011	Absolute Peace (91431)
08	2007	Liquid Souls (23311)
09	2009	There is God (56937)
10	2010	With Music it is a fantastic Adventure (82679)
11	2001	Ketamine Wasted My Jesus (1149)
12	2011	Addiction, Medical Issues (81450)
20	2007	One Gram Binge (40864)
22	2000	Ketamine and the Exploration of Consciousness (1968)
25	2011	The Way K Creeps (87839)
26	2004	Navigating Through K-Space (20082)
27	2002	Unusual Experience (Wet Road) (11455)
29	2000	K Confessions (2731)
30	2009	Cosmic Orgasm (62998)
32	2009	Ego Rebooted, Reformated, and Defragmented (79954)
33	2002	Face to Face With My Soul (9278)
34	2010	So That's What Death Feels Like? (71148)
35	2001	Worst Trip Ever (3841)
39	2007	Come with Me on a Journey Through Space (60261)
51	2002	Shadow of My Former Self (6312)
52	2011	Serious Problem (91936)
53	2002	Ketafiend (15640)
54	2009	Years Ruined by K Addiction (74825)
55	2007	A k-hole Missed… Was an Opportunity Gained (61734)
58	2003	Deep Into the K-Hole (none)
59	2009	Stomach Pain Caused By Abusive Usage (76732)
60	2010	Ruined My Bladder (81831)

of its preferable effects – side-effect ratio (reports 24, 43):

I began to use GHB almost daily in place of alcohol, which I had previously used to mask my anxiety and difficulty socialising. GHB did the job of alcohol but with the added benefits of a nice physical buzz and no hangover or sick feeling (report 36).

One female user reports injecting ketamine intravenously as a substitute for heroin (report 35); another reports buying ketamine for the 'comedown' when the effects of ecstasy started to wear off (report 20); and yet another states that she and her boyfriend initially took GHB because of its anabolic properties (report 40).

Setting

Most reports describe experiences with ketamine or GHB taken in home settings, either alone or, more frequently, in the presence of partners, friends and 'trip-assistants' (reports 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11,

Table 2: Erowid reports on GHB.

Report No.	Year	Title (Erowid ID)
13	2002	Changed My Life (5803)
14	2005	Is GHB Unpleasant? I Don't Think So! (8614)
15	2005	Trying New Material (48512)
16	2000	What Was I Thinking? (2415)
17	2005	OD, Hospitalization (1356)
18	2008	Partying (43543)
19	2000	G at the Club (951)
21	2011	Buzz, Never a Hangover (89508)
23	2003	Don't Touch It (7702)
24	2004	I Made It Through (8850)
28	2005	Tapering Off to Avoid Withdrawal (47659)
31	2010	Addiction and Withdrawal (86922)
36	2006	GHB for Anxiety, Dosing Requires Great Care (54578)
37	2004	Be Patient and do the Research (9381)
38	2005	It Sucks (12873)
40	2011	Passed Out (39193)
41	2005	Usage & Withdrawal (14499)
42	2011	Fun Until I Took It Too Far (73081)
43	2004	Negatives vs Positives (8379)
44	2011	Finding the G-Spot (82484)
45	2004	Oh No, I Wouldn't Get Addicted (10946)
46	2007	The Time Machine (21138)
47	2007	This Drug Scares Me (65911)
48	2001	The Withdrawal Process (4959)
49	2003	GHB: Proceed Carefully (7462)
50	2005	Help with Addiction (11121)
56	2005	A Dosage Experiment – How Much to Take? (27080)
57	2005	A High School High (42780)

12, 13, 14, 15, 16, 17). Only a few reports mention the experience of taking GHB in a dance club (reports 18, 19) and only one describes a ketamine experience in a club (report 04). However, some users state that they first came into contact with ketamine and GHB in clubs (reports 05, 12, 20, 21, 23, 24, 53). This is of significant interest, since both drugs are referred to as 'club drugs' in the general press as well as in the biomedical literature.

Subjective effects

Despite some crucial clinical and recreational commonalities, ketamine and GHB are reported to have their own distinct characteristics and the reports from Erowid clearly distinguish the subjective effects of each drug.

In most reports, ketamine exhibits the features of a hallucinogenic drug. Visual hallucinations such as perceiving patterns or colours on white walls are commonly described under the influence of the drug (reports 03, 04, 05, 10, 11, 12, 26, 30). Often, these hallucinations are accompanied by alterations of mood and thought content and are described as dark and cold, or rather organic: 'Blood red carpets, ornate textures, fleshy forms sometimes hideously deformed and distorted. Everything was pure Thanatos – chaos, blood and darkness, but breathtaking in beauty and grandeur' (report 26). Ketamine users often experience transpersonal

phenomena such as mystical insights, spiritual trips, revelations or alternative realities. Time and space seem to be transformed and lucid dreaming or the feeling of being in contact with a higher self or god may occur (reports 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 29, 32). One ketamine user describes his feeling of omnipotence: 'We believed we had superpowers ourselves and with great conviction, I and my girlfriend were trying to lift things in the air. I really felt like a god' (report 04). Ketamine experiences described on Erowid also include near-death experiences or the feeling of being reborn (reports 33, 34). Some users report psychotic experiences such as bad trips, fears or nightmares under the influence of the drug (reports 02, 04, 11).

There are references to ketamine's profound antidepressant effects (reports 03, 22, 54). A user with a history of depression and nicotine and alcohol dependence states:

I began to consciously focus on the present and reduce anxiety related to unfounded worrying about the future, which has been a source for my depression. I immediately kicked a three year cigarette habit and what had become a steadily increasing drinking pattern was greatly moderated as alcohol no longer seemed particularly relevant to my life (report 22).

GHB users tend to report feelings of euphoria, physical wellbeing, stimulation and empathogenesis after ingesting the drug (reports 15, 16, 17, 21, 23, 24, 36, 37, 38, 40, 41, 42). GHB is often reported to enhance sexual arousal and performance during intercourse or masturbation and use for the purpose of sexual disinhibition is reported by both men and women (reports 14, 15, 46, 44, 45):

I start to feel even more during the sex, it's more ecstatic than normal. He's much more open emotionally and saying all kinds of nice things; I'm more in my body and feeling little energy surges in my limbs (report 15).

One user reports having taken health risks under the prosexual effect of the drug: 'Felt much more confident approaching women, not a bad thing; but ended having unprotected sex with a few whom I, in retrospect, should have had serious concerns about' (report 45). In contrast to the enhancement of bodily sensations with GHB, many ketamine users state that they felt disconnected from their bodies (reports 03, 05, 39):

I felt like parts of my body were missing. My hands seemed to be disconnected from my arms, or I was no longer aware of anything between my hands and shoulders (report 03).

Often these dissociative effects, which at times merge into full-blown, out-of-body-experiences, are described as fascinating or liberating in that the absence of the body opens up to the exploration of the mind:

I consider this – the fact that there is more to explore without my body, without my eyes, just within my own mind/consciousness – a very fascinating concept. It's as if there is a completely different dimension, and possibly many different dimensions, which can only be accessed through the 'portal' of my mind (report 05).

This dissociative state of consciousness may be the reason one user explains that 'Sex on ketamine can be frustrating, disorienting, even downright weird and eerie' (report 26).

Some users say that GHB helped them to lift their temporary depressed mood (reports 13, 15, 36, 45). One describes a phase of increasing use (which finally led into addiction and psychiatric hospitalisation), which was motivated by some positive effects 'in terms of overcoming anxiety and depression, abreacting out some long standing personal issues, and on creativity and productivity'. Another user with an anxiety disorder describes a similar effect of GHB:

As I am afflicted with anxiety/panic disorder, I noticed that GHB was more effective than

benzodiazepines (Xanax) at eradicating any form of attacks, and was definitely a social facilitator […] GHB seemingly has the calming effect of benzos without the weakness (problems performing in sports) I also found that it altered my memory less significantly in the context of studying (report 28).

One user with a depressive disorder describes a sustained anti-depressant effect of GHB:

I'd been on other meds in the past in the course of therapy for brief periods and I must say in my limited experience the G [GHB] beats them all. It has been an antidepressant/antianxiety agent/mood elevator par excellence. […] No damage at all that I've noticed, but a positive alteration for sure. It toned my body and my mind; like a kind of brain-nutrient (report 13).

Undesired toxic effects and addictive potential

Undesired toxic effects such as vomiting, problems with respiration and loss of consciousness are more frequently reported by users of GHB than ketamine (reports 13, 23, 38, 40, 47, 48, 56, 57). Gastrointestinal problems such as vomiting and cramps are described as effects of ketamine intoxication, while one report also mentioned urinary tract problems (reports 06, 26, 52, 58, 59, 60). Lower urinary tract dysfunction with symptoms such as urinary frequency, nocturia, dysuria, haematuria and incontinence has been recently described in the medical literature to be a serious adverse effect of problematic ketamine use (Mason et al., 2010).

The addictive potential of both ketamine and GHB is a subject of discussion in the Erowid reports. Physical withdrawal symptoms after chronic use of GHB are reported to be common (reports 12, 16, 26, 31, 41, 45, 48, 49, 50, 51, 52, 53, 54) and lasting for weeks, during which different stages of withdrawal are passed:

The main withdrawal symptoms (sweating, hot flashes, elevated blood pressure, muscle aches, tremors, etc.) actually dissipate fairly quickly – within a day or so. The inability to sleep and the anxiety last a lot longer (report 31).

Most users reporting long-term and regular use of ketamine say that they never felt physical addiction, but often a strong longing for the drug (reports 12, 25, 26, 29, 33, 54). This psychological dependence is described by one user as a constant craving for the transpersonal phenomena induced by the drug: 'The reality created by ketamine was so real that it made me doubt my other reality. I continually returned to ketamine in the search for answers' (report 33).

5 Conclusion

The socio-cultural developments and current uses of ketamine and GHB have significant overlap. The histories of both substances started in the early 1960s, the golden age of psychopharmacology, with improved reputations in the medical world due to their unique anaesthetic effects. Furthermore, both drugs were appealing for psychiatric practice, especially as psycholytic agents, but the rise of the now classic tranquilisers and antidepressants brought an end to this appeal. Then, by the end of the 1990s, the decline of their clinical anaesthetic reputation coincided with the advent of their new career as club drugs. As such, ketamine and GHB gained an ambiguous reputation: both drugs were apparently difficult to handle in party settings due to their narrow dose-effect spectrum, and both were reportedly used as 'date-rape drugs'. Recently, psychiatry has taken them back to the medical spotlight and launched them as new players in the quest for new pharmacological treatment strategies for major depressive disorders.

In order to demonstrate current illicit user practices of ketamine and GHB, with a focus on self-experimentation and self-medication,

a qualitative analysis of Erowid reports was performed. Erowid is one out of many websites, where users discuss their drug experiences. Thus, our analysis follows an illustrative purpose and represents a highly selective population of drug users. The analysis of the Erowid user reports shows divergent effects of ketamine and GHB in self-experimental settings. According to the reports we selected, ketamine induces mental travelling and abstract self-exploration of 'darker' dimensions of consciousness, while in contrast, GHB is reported to be mainly used for its mood-lifting properties. The combination of feelings such as euphoria, relaxation, empathogenesis, enhancement of physical stimulation, especially in the context of sexual practice, characterises GHB as a hedonistic drug rather than as a drug used for 'mind expansion'. Analogously, GHB users on Erowid more often describe undesired toxic effects and physical withdrawal symptoms, while ketamine users emphasise mental disturbances such as bad trips and psychological cravings. Despite these differences, some ketamine and GHB users also share similar aims, as both drugs are frequently described as taken illicitly to treat certain mental disorders such as anxiety, depression and sleep disturbances.

It is noteworthy that the Erowid user reports refer mainly to use in home settings, despite GHB and ketamine commonly being referred to as 'club drugs'. This observation may redirect the attention of researchers or the press from the visible phenomena of drugs in clubs to drug consumption settings and patterns that are more hidden.

Concerning the 'meaning of high', a clear distinction can be drawn between medical and self-experimental use of ketamine and GHB, keeping in mind the limited degree to which the highly selective analysis of Erowid user reports can be generalised. Apart from their use as anaesthetics, today's researchers and clinicians administer these drugs in strictly controlled settings in order to induce exceptional states of consciousness in experimental subjects and to relieve symptoms of depression in patients. These medical experiments aim to advance the fundamentals of biomedical knowledge and to explore indications for the treatment of mental disorders. In contrast, many ketamine and GHB users experiment in quasi-experimental, private settings (as shown by the self-reports containing background information such as dosage, gender, timings etc.) as realms of experience for self-exploratory needs. The intention of illicit ketamine and GHB users reporting on Erowid is often (self-)healing and relief of individual suffering, an aspect of the drugs' use that mirrors the treatment intentions of clinical psychiatrists.

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