

Methoxetamine (MXE) – A Phenomenological Study of Experiences Induced by a “Legal High” from the Internet

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Abstract—Methoxetamine (MXE), a ketamine analogue, is one of the new “legal highs” sold on the Internet. The aim of this qualitative study was to provide an initial understanding of what characterizes the experiences induced by MXE. Anonymously written reports (33 persons) on the effects of MXE were collected from public Internet forums and analyzed using the Empirical Phenomenological Psychological Method. The analysis generated 10 themes: (1) preparation, motivation and anticipation; (2) initial effects; (3) malfunction of cognitive processes stabilizing normal state; (4) inner personal processes and learning; (5) emotional processes; (6) altered sensory perception; (7) dissolution and transition; (8) spiritual and transcendental experiences; (9) effects and processes after the experience; (10) re-dosing and addiction.

MXE induced a heavily altered state of consciousness. The effects were similar to those induced by classic hallucinogens (such as LSD, psilocybin) and the dissociative ketamine. MXE seemed to have quite a high abuse potential. Beside the positive effects described, negative effects like fear and anxiety were also reported. Acceptance was considered the best coping strategy. Dissolution of identity and body often culminated in spiritual and transcendental experiences. More research is needed on safety issues, how to minimize harm, and the motivation for using legal highs.

Keywords—altered states of consciousness, hallucinogen, Internet drug, legal high, methoxetamine, MXE, psychedelic

INTRODUCTION

In recent years, the emergence of new, unregulated psychoactive substances has increased, where now

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a plethora of new, untested drugs exist (often labeled “research chemicals” or “legal highs”). These drugs are especially designed to be legal alternatives to the established illegal drugs (Gibbons 2012; Kjellgren & Soussan 2011; Schmidt, Sharma, Schifano & Feinman 2011; Wohlfarth & Weinmann, 2010). Between 1997 and 2010, European drug monitoring authorities (EMCDDA) identified more than 150 new psychoactive compounds, of which 65 were identified in 2009 and 2010 (EMCDDA 2011). Most of these novel psychoactive compounds can be classified as amphetamine- or ecstasy-like stimulants; hallucinogens; or synthetic cannabinoids (Zawilska 2011).

These new substances are widely distributed on the Internet, and can be bought by anyone with a credit card and a shipping address. Information regarding safety, content, interactions, and side-effects is seldom provided (Schmidt et al. 2011). Reliable information regarding long-term effects, toxicity, and abuse potential are mostly missing as well. Many of these new drugs are also unfamiliar to clinicians and health care providers (Rosenbaum, Carrero & Babu 2012; Babu, McCurdy & Boyer 2008). The use and availability of these so-called legal highs are increasing (EMCDDA 2011). Several studies indicate that the prevalence of “legal high” drug use is highest among youths, more specifically in the group of males aged 16 to 25 (Vardakou, Pistos & Spiliopoulou 2010; Babu et al. 2005).

The present study investigates a new compound called methoxetamine (MXE). MXE has been described as sharing many similarities with ketamine (Corazza et al. 2012; Hofer et al. 2012), regarding effects and chemical structure, and therefore might have a similar high abuse potential (Ross 2008). MXE first appeared in 2010 and has been extensively marketed by “head shops” on the Internet, most of which offer international shipping (EMCDDA 2011). Several persons have been hospitalized after using MXE recreationally (Shields et al. 2012; Wood et al. 2012; Ward et al. 2011). Since information regarding MXE is scarce (Corazza et al. 2012), it made a good candidate for investigation.

MXE, 2-(3-methoxyphenyl)-2-(ethylamino)cyclohexanone, is a derivative of ketamine (UK Advisory Council on the Misuse of Drugs 2011). The substance is said to be developed by a UK-based research chemist with the aim to create a safer alternative to ketamine (Morris 2011), especially in regard to urinary tract problems that can arise from frequent use of ketamine (Wood et al. 2012). Analysis, characterization, and synthesis of MXE have been performed by the DEA Special Testing and Research Laboratory (Hays, Casale and Berrier 2012), who also presented analytical data about MXE compared to the structurally similar drug ketamine. Until more research about MXE exists, effects induced by ketamine can be a valuable reference in the initial mapping of MXE.

Ketamine is a well-known and commonly used anesthetic, which has been established as physically safe to ingest by humans (Jansen 2001; Ross 2008). There is no evidence regarding long-term neurotoxicity or prolonged psychological negative effects when used in a controlled clinical setting (Krupitsky & Kolp 2007; Khorramzadeh & Lofty 1973). But ketamine is also known as a “club drug,” and in the club scene is regarded as having two established dose-effect levels: A lower one, yielding recreational effects, and a higher one, resulting in complete anesthesia (Jansen 2001). In the last decade, recreational use of ketamine has increased (Ross 2008), and several studies have indicated that ketamine has addictive properties

(e.g., Vollenweider et al. 2000). When used frequently, behavioral tolerance develops in animals (Benthuysen et al. 1989) and in humans (Wolff & Winstock 2006). Heavy dependence on ketamine has been observed in humans (Moore & Bostwick 1999), as has a comparatively high addictive prevalence among recreational users (Winstock et al. 2012; Jansen 2001).

Paradoxically, ketamine has been used to treat dependence disorders in a controlled therapeutic setting. Ketamine psychedelic psychotherapy (KPP) (Corazza & Schifano 2010; Krupitsky & Kolp 2007; Jansen, 1989) has been used to treat about 1000 patients with dependence disorders, in which the abstinence after one year was 66% (Ross 2008). Ketamine has also been linked to anti-depressant effects (Aan Het Rot, Charney & Mathew 2008; Zarate et al. 2006; Berman et al. 2000), and has been used to alleviate fear, depression, and suicidal ideation in terminally ill patients (Thangathurai & Mogos 2011).

Because of the many similarities with ketamine, it has been suggested that MXE might share the same neuropharmacological properties as an N-methyl D-aspartate (NMDA)-antagonist and dopamine reuptake inhibitor (Bonta 2004; Jansen 2001; Jansen 1989). Earlier studies (Corazza et al. 2012; Rosenbaum et al. 2012) have summarized MXE’s clinical effects by reading experience reports and drug forums on the Internet. MXE has, in these studies, been described as a short-acting mood enhancer with hallucinogenic and dissociative effects; with adverse reactions such as confusion, time distortion, aphasia, psychomotor agitation, nausea, anxiety, and paranoia. A short comparison between MXE and ketamine regarding dosage, duration, and effects is provided in Table 1 and is based on data from user reports published on <http://www.erowid.com>. Data suggests that MXE seems to be more potent and longer-acting than ketamine, but the induced effects are similar.

No qualitative study with the primary aim of characterizing the phenomenology of the MXE experience has to our best knowledge been carried out. A search in the major scientific databases in May 2012 (PubMed; Science direct; Scopus; Psychinfo) yielded a total of six articles with the primary purpose to investigate MXE. One study concluded that the low level of information regarding novel psychoactive drugs (as MXE) in combination with increased interest might soon constitute a great challenge to public health care (Corazza et al. 2012).

The present study focused on public Internet forums where experiences from use of MXE were discussed. Since controlled experiments with MXE do not exist, analyzing already existing data qualitatively is a valid option if, for instance, the analysis is based on a qualitative research approach that aims to understand phenomena in a context-specific setting, such as a “real-world setting where the researcher does not attempt to manipulate the phenomena of interest” (Patton 2001, p. 39). A phenomenological

TABLE 1
Comparison between MXE and Ketamine: Based on User Reports from <http://www.erowid.com>

| | Methoxethamine | Ketamine |
|-------------------------------------|---|---|
| Common dosage (recreational use) | 20–60 mg insufflated | 30–75 mg insufflated |
| Duration | 40–60 mg oral | 75–300 mg oral |
| | 15–30 mg intramuscular | 25–50 mg intramuscular |
| | 2,5 – 4 h insufflated | 45 – 60 min insufflated |
| | 3 – 5 h oral | 60 – 120 min oral |
| Positive effects | 2 – 3 h intramuscular | 30 – 60 min intramuscular |
| | euphoria | euphoria |
| Neutral effects | sense of calm and serenity | sense of calm and serenity |
| Negative effects | distortion or loss of sensory perception | distortion or loss of sensory perception |
| | severe dissociation, depersonalization, loss of consciousness, nausea, vomiting | severe dissociation, depersonalization loss of consciousness nausea, vomiting |

approach emphasizes people's subjective experience and interpretations of the world. This study had the ambition of arriving at an initial description that was as close as possible to what the subjects actually experienced during the intoxication. For this, the Empirical Phenomenological Psychological (EPP) method (Karlsson 1995) was chosen. The EPP method is a method grounded in phenomenological theory and aims to describe rather than to explain a phenomenon.

The aim of this qualitative study was to use Internet forums to provide an initial understanding of what characterizes the experience induced by the substance methoxetamine (MXE).

METHOD

The Empirical Phenomenological Method (EPP) is a scientific approach for exploring and describing subjective experiences and its perceived meaning. The analysis process emphasizes an open and bias-free attitude towards the data (Karlsson 1995).

Data Collection

The data were collected on the Internet by searching for anonymous and publically published accounts of experiences of MXE. The Google search engine was first used (all languages) to identify "MXE-reports." The words "Methoxetamine" and "MXE" were used alone and in different combinations with the words "report," "experience," and "trip." The first 30 hits of every search were examined more closely. A total of 13 sites related to methoxetamine ingestion were identified (Table 2). These 13 sites were examined in more detail to identify written accounts of experiences related to the intake of MXE. Search engines on the sites were used when provided; otherwise the sites

were manually searched. When a site offered a forum categorization for drug-related experience reports, the search was limited to this category only. Exclusion criteria were: incomprehensible language; when other drug(s) had been taken in adjunction with the methoxetamine (exception was made for tobacco); and when the account had been found previously in the data collection. In total 94 accounts were found, and after exclusion 33 remained (Table 2). When an account was accepted as data, usernames and complete URLs for specific threads were deleted to further protect the identification of authors. All searches were made between October 1 and October 12, 2011.

Participants

The accounts of the methoxetamine experiences were written by 33 anonymous authors (32 males, one woman) and published on public Internet forums. Age could not be presented, since it was rarely stated in the reports. The amount of methoxetamine ingested during a session varied between 10-200 mg (mean = 88 mg). Four reports lacked information about dosage. The most common route of administration was insufflated ($n = 21$), but there were also instances of intramuscular injection ($n = 5$), oral ($n = 3$), and sub-lingual ($n = 4$) administration.

Analysis

The 33 reports were transferred to a Word file for detailed analysis in accordance with the EPP five-step model (Karlsson 1995).

Step 1. The reports were read three times in order to get an overview of the material, and to identify relevant psychological phenomena without testing validity or any specific hypothesis.

Step 2. The text was divided into smaller units, called meaning units (MU), without regard to grammatical rules.

TABLE 2
Sites that Contained Reports Regarding Experiences Resulting from MXE Ingestion, and Reports Remaining after Exclusion Criteria had been Applied

| Website | Language | Reports found | Reports after exclusion |
|-----------------------|----------|---------------|-------------------------|
| www.erowid.org | English | 33 | 11 |
| www.shroomery.org | English | 0 | 0 |
| www.bluelight.ru | English | 39 | 13 |
| www.partyvibe.com | English | 0 | 0 |
| www.opiophile.org | English | 0 | 0 |
| www.thetripreport.com | English | 0 | 0 |
| www.hipforums.com | English | 0 | 0 |
| www.reddit.com | English | 3 | 0 |
| www.zoklet.net | English | 0 | 0 |
| www.dmt-nexus.com | English | 0 | 0 |
| www.waytomany.com | English | 0 | 0 |
| www.tripme.co.nz | English | 0 | 0 |
| www.flashback.org | Swedish | 19 | 9 |
| Total | — | 94 | 33 |

These divisions were performed every time the subject changed the substantial meaning of the text, as in this example yielding two MU: (1) *"I started feeling how my body expanded and morphed in various shapes (2) and got this feeling I would be like this forever."* This step yielded 667 MUs.

Step 3. All MUs were transformed from the subject's language to the language of the researcher, with the purpose of highlighting the implicit meaning by restating it in objectivized terms. The transformed MU from the example above were thus restated as: (1) The perception of the body was altered. (2) The person experienced paranoid feelings.

Step 4. The transformed MUs were brought together into a coherent structure or categories by examining their characteristics and similarities. A key aspect throughout the categorization process was to understand what a phenomenon is (noema) and how the phenomenon is expressed (noesis). The categories took shape through repeated consulting of the raw data. In total, 39 categories were created (Table 3).

Step 5. In the final step, the focus was shifted from the situational structure of local categories to more general themes or structures. The purpose was to raise the level of abstraction. This resulted in 10 themes (Table 3).

To maintain validity, the steps in the EPP method were carefully performed, whereby according to Karlsson (1995) a high validity is ensured. Also, we have tried to provide adequate argumentation supporting the interpretations of the data, which is of importance for strengthening the validity. Though it is probably impossible to be totally free of bias, a non-judgmental and open attitude to the

data has been a beacon during the analysis. In order to obtain interpretative validity (Maxwell 1992; Erickson 1989), considerable efforts have been made to respect the experiencers' perspectives.

Ethical Considerations

Reports were posted on public Internet forums. It is not possible to identify any single user. All details about cities, countries, names, and schools were omitted from the analyses. Usernames or complete URLs for specific threads on the forum were deleted.

RESULTS

Ten themes emerged, which are presented below with representative quotations.

Preparation, Motivation, and Anticipation

The first theme (categories 1–3) summarizes experiences of preparation, motivation for drug ingestion, and anticipation of the coming drug experience. The motivation was sometimes for recreational purposes, but specific reasons, such as to enhance creativity or to benefit from expected therapeutic effects, were also given. For some persons, the reason for ingesting MXE was because a similar drug (ketamine) was not available.

Anticipation and nervousness were experienced, mostly due to not knowing what to expect, since for many it was the first time they tried MXE: *"I was like a kid on Christmas morning, but at the same time scared as hell. It was point of no return. The only thing to do now was to kick back and wait for the drug to kick in . . ."*

TABLE 3
The Categories and Themes that Emerged During the Analysis Applying the Empirical Phenomenological Psychological Method by Karlsson (1995)

| Theme | Included categories |
|--|---|
| 1. Preparation, motivation and anticipation | 1. Anticipation and nervousness prior drug effects (9 MU) 2. Motivation and intention (7 MU) 3. Preparation (35 MU) |
| 2. Initial effects | 4. Decreased control over body (21 MU) 5. Disorientation and confusion (12 MU) 6. Increased appreciation of music and film (19 MU) 7. Initial effects (10 MU) 8. Intensified sensory perception (16 MU) 9. Social interaction (21 MU) 10. Somatic effects (33 MU) |
| 3. Malfunction of cognitive processes stabilizing normal state | 11. Decreased ability to concentrate and focus (8 MU) 12. Difficulties comprehending and expressing language (22 MU) 13. Effects on memory (8 MU) 14. Effects on time perception (19 MU) |
| 4. Inner personal processes and learning | 15. New perspective (9 MU) 16. Personal psychological insight (22 MU) 17. Strategies for coping with experience (16 MU) 18. Thoughts regarding constitution of reality (7 MU) |
| 5. Emotional processes | 19. Emotional opening (11 MU) 20. Euphoria (11 MU) 21. Free from fear and worry (11 MU) 22. Wellbeing and elation (26 MU) 23. Worry, anxiety, and fear (22 MU) |
| 6. Altered sensory perception | 24. Altered perception of body (11 MU) 25. Altered perception of external reality (35 MU) 26. Synesthesia (4 MU) |
| 7. Dissolution and transition | 27. Experience of dying and losing self (13 MU) 28. Loss of contact with outer reality (8 MU) 29. Merging of inner and outer reality (9 MU) 30. Transitional experience (19 MU) |
| 8. Spiritual and transcendent experiences | 31. Entrance into new worlds (26 MU) 32. Inner interaction with other subjects (10 MU) 33. Mystical insight (14 MU) 34. Upheaval of time and space (9 MU) |
| 9. Effects and processes after the experience | 35. After-effects (28 MU) 36. Re-becoming (3 MU) 37. Reflections after the experience (42 MU) |
| 10. Re-dosing and addiction | 38. Re-dosing (28 MU) 39. Addiction (33 MU) |

They prepared in many ways before taking the substance. Most people arranged to make sure not to be disturbed. Some preferred to be alone, others with a friend or in a small group. The environment was made “cozy”;

e.g., to light candles, prepare music, clean the house, or make sure fruit and beverages were available: “. . . I made the final preparations for the trip. Filled my mp3-player with music from the computer, fetched water from

the kitchen and then went to my tent to wait for the effects . . .”

Mostly, safety precautions were taken; e.g., testing for adverse reactions by first ingesting a small amount; having a sober person present; or making sure that clean syringes were available in cases where the drug was injected. In a few cases, safety precautions were not taken at all (e.g., remaining unaware of the amount of substance ingested, or using the drug in a chaotic environment). Also, one case of irresponsible behavior (trying to drive a car during the intoxication) was described.

Initial Effects

This theme (categories 4–10) summarizes experiences of the drug effects in the beginning of the intoxication. In general, a wide range of somatic effects (for example, increased heart rate, nausea, and sweaty palms) were reported. Pleasant anesthetic effects soon overshadowed these effects: *“Everything first felt heavier than usual, and my body started to feel a bit numb. At the same time a feeling of pleasure emerged. After a while I just sat there and everything felt very nice.”* Also, a decreased motoric control of the body was reported: *“I tried to walk to the bathroom and found this very difficult.”* In contrast to these numbing bodily sensations, an increased sensitivity to the surroundings was simultaneously experienced (e.g., increased sensitivity to light or smells). Increased interest in film and music was reported, and these were considered as more interesting and emotionally engaging. Some described their experience as influenced by environmental stimuli: *“The music led my imagination go to where its imagery delighted, and for every nuance of every song an entirely new theme and feel was directed to my perceptions.”*

The initial effects could create disorientation and confusion, especially for those who used the drug for the first time: *“Walking, sitting on the bed and laying down was an effort and produced waves of confusion and disorientation. I actually catch myself asking: Are you there?”* Another person wrote: *“I am confused and feel that I am forgetting something but I don’t know what. It is hard to explain.”*

Social interaction was promoted at this early stage, with an urge to interact with other people: *“Earlier I had put my mobile-phone on flight mode so nobody would disturb me, but suddenly I felt an urge to call my two best friends to tell them I tried MXE.”* Some, however, described the opposite effects of avoiding people that were not aware of them taking a drug (e.g., fear that a parent would notice).

Malfunction of Cognitive Processes Stabilizing Normal State

The third theme (categories 11–14) summarizes experienced malfunctions of cognitive processes that make up everyday life. If the doses were high enough, the

“coming-up” stage gradually progressed and in some aspects counteracted initial effects (see above). The ability to use and understand language was impaired, and in some cases language lost its meaning altogether. Previous effects of increased social drive now decreased: *“Ability to talk at all is greatly impaired so we resort to just mumbling to each other and touching.”*

The normal way of perceiving time was altered; time elapsed at a slower or faster rate: *“It’s now three hours since my first dose! Time had gone really fast. Now when I had realized this the time began to go very slow.”* Many could no longer manage to keep track of time; some were filled with a sense of timelessness.

The ability to concentrate and focus was also affected. It was no longer possible to follow a movie, to read, or do simple tasks at the computer. Reduced function of short-term memory was described: *“I keep forgetting what is going on. I am sitting here and thinking, then forget what I was thinking about, or talking to my girl and forgetting what we were talking about in the middle of the conversation”.* Occasionally, failure to remember being under the influence of a drug occurred; one person chose to take more of the drug, unaware of the amount previously ingested.

Inner Personal Processes and Learning

The fourth theme (categories 15–18) encompasses inner psychological processes and learning that were attributed to the drug-induced experiences. The altered state induced by MXE seemed to create a new vantage point where the subjects’ own lives could be viewed in a new light. This seemed to enhance the ability to identify important things in their lives, such as a new understanding in personal matters: *“I started thinking about the relationships in my life, about how what I want most in my relationships is genuine interaction, as simple and obvious as it may sound.”* These new perspectives resulted in inspiration for specific life changes (e.g., to quit an ongoing destructive relationship), or in a more general drive to evolve as a person.

The drug-induced experience could be a hard and intense experience, which for some made the normal day to day struggles seem easier: *“. . . the next day even the biggest challenges in the ‘real world’ seemed like peanuts to what I’ve experienced.”*

The drug experience also promoted learning in other ways, such as finding new coping strategies; simply accepting the state induced by the drug was a successful strategy for managing anxiety, fear, or panic, and often propelled the experience in a positive direction, making it possible to go further into the experience: *“I just let go of myself. I was able to step away from my worries and look at them, and then I knew whatever happened I’ll make it through this.”* In some cases, this acceptance during intoxication could be generalized more broadly (e.g., acceptance of painful events in life).

Learning also took place when subjects conceived the experience as “real,” which gave rise to questions regarding the concept of reality. For some, intricate philosophical reasoning was activated, which could result in a positive and broadening view of life. For others, it could result in a more negative outcome, creating ambivalence regarding what was “real”: “.. *I lost grip that I had taken a drug and started to believe that the hallucinations were real, or maybe it had always been like this? I did no longer know the difference.*”

Emotional Processes

This fifth theme (categories 19–23) addresses emotional experiences. Many persons described worry, anxiety, fear, or paranoia during some part of their experience. Often this was connected with decreased control, of being caught in the experience, or by overwhelming intensity. Paranoia arose when they believed they had gone crazy, or when they believed they would be affected permanently: “*I started to get scared I was insane or was about to be. Would I never get down from this thing? I managed to call a friend that could be a lifeline to my last bit of sensible reality.*” Paranoia also arose when they believed the body would collapse, creating a negative spiral of cognition and perceived bodily stimuli: “. . . *I started to feel that something was very wrong. My heart was beating like it was about to pop out from my chest. I didn't know how to interpret what was happening to me, and was way too disorientated to make a proper judgment. I got scared and decided to call an ambulance.*”

Reports of an exceptional absence of negative emotions were given, when it was no longer possible to feel fear, “*as if a switch had been turned off.*” This could be the case even if the subject perceived stimuli that otherwise would be considered scary. In some rare cases this absence of fear led to a sense of being invulnerable: “*I was so at ease and prepared for anything. I felt, dare I say it, God-like, totally untouchable. If evils spirits wanted to take my soul as I was walking around these forgotten worlds then they were no problem for me.*”

Many persons described positive feelings of peacefulness, joy, elation, and euphoria together with cognitions that “*everything was just as it should be.*” Often strong positive emotions followed an earlier episode of negative emotions in which the subject had struggled in some way.

Intense emotional release was in some subjects connected to processing of old painful experiences; for example, the loss of a loved one. This was often characterized by an outburst of strong emotional feelings, later followed by a feeling of relief: “*I was crying my eyes out at some vivid memories I had, some very vivid memories of my recently deceased friend X. I was able to talk with him and I felt at ease with death, despite the night before having a huge panic attack while driving home about death. It never felt too intense, while at the same time being the most intense thing ever.*”

Altered Sensory Perception

This theme (categories 24–26) addresses descriptions of altered sensory perception. The perception of distance and proportions changed. For some, the room seemed smaller or bigger than usual (e.g., the room was perceived to be as big as the whole universe).

Objects in the outer reality were incorporated into the subjects' imaginations, and transformed into something different; for instance, an enormous flower appeared where the person was sitting, or a friend transformed into an alien entity: “*I looked at my girlfriend and she looked like some sort of ancient South American Goddess sitting on this really weird square temple. Then everything, including myself seemed to be made up of cubes. My body, my dog, everything in my room was made of moving, melting, morphing cubes.*”

The perception of the body image could change, for instance into feeling heavier or lighter than normal. A common feeling was that the body was “floating” outwards into the room, and for some even further into space. The sense of bodily proportions was affected, so that limbs were perceived as several meters long or the body was felt to encompass all of Earth: “*I felt my body was literally the size of the Earth. It morphed and changed continuously into a variety of enormous shapes.*”

In some subjects, synesthesia was reported. The most common form was to perceive auditory stimuli visually. For some all sensory input seemed to melt together: “*It was totally bizarre. The room felt like a painting of Salvador Dali. None of the physical laws seemed valid anymore and all my senses melted together into a porridge of surrealism.*”

Dissolution and Transition

This theme (categories 27–30) summarizes experiences of dissolution of the normal identity, often followed by a transition in which the experience took a new direction and/or changed drastically.

The drug affected the sense of self, especially with higher dosages. Initially, this was experienced as a “drifting” or “floating” from outer reality, or a sense of going deeper inside. Outer stimuli previously of great interest suddenly lost their meaning. Instead, the normal-state identity began to dissolve, and they believed they were about to die. This was often accompanied with an intense or painful struggle, which in most cases could only be resolved when the person accepted what was happening and went along with the experience. One person wrote: “. . . *I felt how my mind started to disintegrate and I was terrified. Then I was hit by something like a bomb. Everything got dark and all sounds went silent. I died.*”

In some cases, inner and outer reality merged together and the boundary between inner and outer started to dissolve. Some also felt their bodies started to dissolve, initially experienced as if the body expanded its boundaries: “*I am no longer a body in a world, but a speck*

of consciousness floating down in an infinite purple-black velvety nothingness." This perceived loss of normal-state identity, body and/or inner-outer sense of boundary were often followed by a transitional experience.

Spiritual and Transcendental Experiences

This theme (categories 31–34) summarizes experiences characterized by mystical and spiritual experiences, often following on a transitional experience. Descriptions were given about how time and space, as fundamental concepts, seemed invalid or transcended. Reports were made on gaining knowledge of spiritual matters, such as an understanding of "life's innermost mysteries" or of what would happen in the after-life. In some cases, this resulted in a belief of life after death. Some felt in contact with what they perceived as God, or the totality of the universe: "I was aghast with my unworthiness to be where I was, so deep into the secrets of everything. It was nearly unbearable in its intensity. Yet, I did not long for it to end. I was willing to cease my existence in exchange for this satori. When I finally came out of it, I texted a friend, 'I have breathed the breath of God. And I am a humbler man for it.'"

Many described arrival into novel, dreamlike, and foreign worlds. The descriptions of these worlds could be archaic, mythological or "cartoonish" in nature: "It was like flying through a museum of futuristic artwork hung in a museum composed of glowing crystal. I would travel through one space and then ascend to the one above." Sometimes interactions with other entities in these worlds were reported. The events in these inner worlds often had a significant meaning to the experimenter. Also, experiences of microcosmic worlds were described, such as being inside an atom, or that they looked into the universe innermost particles. "I just kept going deeper and deeper into the fabric of the universe, through the loom, the threads, the molecules of the threads, and onward."

Instances of the dissolution of normally perceived time-space constraints were described, such as time traveling, being at several places at the same time, or reliving embryonic development: "Floating in the center of this space was a single large, round sphere that was glowing brightly with flesh tones. I interpreted this as being a cell or an egg just after fertilization to be more specific. I could appreciate that I was witnessing the genesis of new life. This cell began dividing over and over. I then realized that this was my own birth. As the collection of dividing cells became larger I could feel my body being reborn to the physical environment."

Effects and Processes after the Experience

The ninth theme (categories 35–37) describes experiences when the effects of the drug had subsided. Descriptions of physical after-effects include nausea, fatigue, and insomnia. In low-dose ingestion, no perceivable physical after-effects were reported. In some cases,

the subject felt "weird" after drug ingestion. It was common to report a feeling of happiness and thankfulness for the experience. In some cases, depressive symptoms before ingestion were gone after MXE intoxication. Still others felt empty and drained of energy after the experience.

For those who experienced a loss of self, the return to a normal state was with a sense of relief and inspiration. One quotation: ". . . memories started trickling back to me. I remember having taken a drug, remembered that I was in my room (still took me a long time to recognize it again). I realized that music was playing over the hi-fi. The rolling body sensations began to fade and slowly I came back to Earth with a huge smile on my face."

Post-reflections on the experience were common, including both positive and negative attitudes. Some persons described new interests (e.g., spiritual development, medicine, meditation).

In some cases, the experience was not possible to integrate, especially if it had been more intense than expected. Some persons who had hard and painful experiences warned and advised others against the drug.

Re-dosing and Addiction

The last theme (categories 38 and 39) describes behaviors linked to the addictive potential of the drug. Ingesting more than initially planned, or re-dosing during one session, were reported: "For some unknown reason I took even more (of the MXE). It just felt natural to do so even though I felt really wasted." Some described they had lost control over drug intake, and also expressed a belief the drug was addictive: "The day after I searched for my bag (with MXE) but couldn't find it in the garbage. Maybe it's for the best because I have found it to be very addictive. I'm already eager for more although I got more than I wanted the first go."

Many had a positive attitude to the drug after the acute effects had ended. It was common with statements about wanting to ingest the drug again, or even the next day after use: "For sure like nothing I'd ever tried before. I loved it, as did the girlfriend. So the next morning (after MXE ingestion) we woke up and spoke a little of how much fun the night before had been, and with matching evil grins asked each other - so what do you want to do today? The answer of course: MXE."

DISCUSSION

Anonymous written descriptions about MXE experiences, posted on public Internet forums, were gathered for phenomenological analysis. The results highlight that MXE induced altered states of consciousness with a wide variety of effects in its users. The effects were in many respects similar to those of classical hallucinogens (e.g., LSD, psilocybin), but also with dissociative effects. Perception, mood, and several cognitive processes

were strongly affected. The entire range from worst fear to euphoria was described. Also, learning and insights from the drug experience were reported. Acceptance strategies were utilized as the most common strategy to cope with the sometimes overwhelming experiences. Dissolution of both personal identity and normal-state perception sometimes culminated in spiritual mystical experiences. Thoughts and behaviors indicating that MXE seemed to have a high abuse potential and could expose the users to harmful effects were also expressed.

Besides psychological risk and the apparent risk of accidents, the abuse potential of MXE seemed to be high. The addictive potential of recreational use of ketamine, a similar drug, has been noted (e.g., Winstock et al. 2012; Jansen 2001), causing concerns regarding MXE. A few persons in the present study described how they visited emergency healthcare centers, but no adverse health effects were reported. However, persons have been hospitalized after using MXE recreationally (Shields et al. 2012; Wood et al. 2012; Ward et al. 2011).

Sometimes the experiences were terrifying. Several coping strategies were described, such as trying to relax and accept what was happening, which was considered the most effective approach, often leading to decreased suffering and personal insights. An interesting parallel can be found in the so-called third wave of cognitive behavioral therapy (CBT) and the emergence of acceptance and commitment therapy (ACT) (Hayes et al. 2005). ACT emphasizes an accepting attitude towards inner and outer experiences in combination with committed actions towards valued goals. Hayes, Strosahl and Wilson (2012) describe how identification with inner thought processes contributes to human suffering, and they suggest acceptance strategies as a way to cope with sufferings.

Despite many descriptions of frightening experiences, it may be surprising that so many positive effects were recounted. The experiences of all drugs are much affected both by the set (e.g., expectations), and the setting (e.g., the circumstances) of intake (Metzner 1998). Many persons in the present study had prepared before the intake, a fact that may contribute to the positive effects described. Also, a strong desire to experience something completely different from the regular daily life certainly contributed to the satisfaction expressed. One speculation is that MXE is used as self-medication (Markou, Kosten & Koob 1998) for people suffering from depressive disorders, since negative moods seems to be (temporarily) lifted and therefore it might result in increased positive effects from ingestion.

In order to understand the reasons behind drug use and developing better drug-prevention and harm-reduction strategies, it is important to acknowledge the perceived positive effects of MXE ingestion. Experiences of increased mood or euphoria during the intoxication are common effects of many drugs of abuse. But the present study also indicates perceived positive effects on daily life subsequent

to the intoxication, including, for example, antidepressant effects, new interests, and inner personal growth. This could indicate that MXE has similar antidepressant effects as ketamine (Thangathurai & Mogos 2011; Aan Het Rot et al. 2008; Zarate et al. 2006; Berman et al. 2000). Close encounters with death (or near-death experiences) were described, and such experiences have in earlier studies (Martin & Kleiber 2005; Groth-Marnat & Summers 1998) been associated with subsequent positive growth and increased quality of life. Several spiritual or mystical experiences were reported; they often arose after a hard period with perceived dissolution of normal-state identity. These experiences induced awe and wonder, perhaps reflecting a drive or desire for spirituality that is not encountered in the secularized western world. Mystical experiences have also in similar studies (e.g., MacLean, Johnson & Griffiths 2011; Griffiths et al. 2006) been rated as highly valued, and with sustained meaning and significance, and positive personality change. The possibility of inducing a mystical experience with MXE (or other similar drugs) may also be regarded as a way of sensation seeking, or a general search for values not previously found.

One limitation of the present study is that it relies on reports from anonymous users on Internet forums, where the precise substance ingested is not known in terms of identification, purity, or dosage. The amounts of MXE ingested by the persons in most cases have been weighted out using a digital milligram-scale. But some of the subjects just “eyeballed” their doses, using their sight to judge the amount. Because of this, the stated amount of MXE ingested should not be mistaken for the actual dose. There is also no way of confirming that their descriptions of the experiences are true. Since no controlled clinical studies with this substance exist, the approach of collecting Internet data at least produced initial knowledge. Many negative effects were also described. This minimizes the suspicion that the experience reports were written as an attempt to glamorize the experience. There are many similarities between the different descriptions, and we believe that the reports are largely accurate and reflect the person’s experiences. Also, the similarities with Corazza et al. (2012) add to their credibility.

The trend of using “legal highs,” especially among youth, is something that probably will not decrease in the future (Corazza et al. 2012; Rosenbaum et al. 2012). The development of additional novel psychoactive compounds is also likely to continue (Rosenbaum et al. 2012). The phenomenon needs to be understood, especially regarding what motivates individuals to ingest untested and potentially dangerous drugs, and also how harms to the users could be reduced. A suggestion for further research is making more thorough and controlled documentation about MXE effects, based on interviews or questionnaires to users, compilation of clinical records, and tracking marketing and discussion on Internet forums.

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