Initiation and continuation: social context and behavioural aspects of ecstasy use
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Citation for published version (APA):
Vervaeke, H. K. E. (2009). Initiation and continuation: social context and behavioural aspects of ecstasy use
Introduction
Short history of a not so new substance

Throughout history, people have been using psychoactive substances in their quest to alter consciousness. In contrast to opium and cannabis, which are known to mankind since prehistoric times (Weil & Rossen 1993), ecstasy is indeed a fairly modern substance. Although ecstasy acquired a reputation as drug that fuelled the ‘rave culture’ since the late 1980s, in reality the molecule is almost a centenarian. MDMA (3,4-methylenedioxy-methamphetamine, the chemical name for ecstasy), was first synthesized at the German pharmaceutical company Merck in 1912, not in order to develop an appetite suppressor (as commonly stated in MDMA related literature), but merely as an unimportant precursor in the search for new clotting agents (medicines to stop bleeding) (Freudenmann et al. 2006). In the early 1950s, sponsored by the US Army, the University of Michigan secretly studied MDMA toxicity by giving MDMA (and seven other psychotropic drugs) to guinea pigs, rats, mice, monkeys, and dogs (Hardman et al. 1973). Contrary to popular belief, there is no evidence in the public domain that MDMA at that time was given to humans, as a truth serum or otherwise (Freudenmann et al. 2006; Holland 2001; Saunders et al. 2000). In the late 1960s Alexander Shulgin, the infamous biochemist and researcher of psychedelic drugs who tested several new compounds on himself and a group of friends, rediscovered MDMA (Shulgin & Shulgin 1991). Fascinated by the compound’s enhancing effects on communication, sense of intimacy and empathy, he introduced it to psychiatrists and psychotherapists in his circle of friends. Consequently, MDMA was used as an adjunct to psychotherapy during the 1970s. The popularity of ecstasy as a recreational drug has started to grow simultaneously with the origin of a new kind of electronic musical genre in the late 1980s, called ‘house’, played at large underground parties or ‘raves’. In the USA, MDMA was scheduled as an illegal drug in 1985, a fact that, obviously, could not prevent the rave culture and ecstasy from spreading towards, amongst others Goa (India), Ibiza, London and continental Europe (Adelaars 1991; Holland 2001; Saunders et al. 2000; ter Bogt & Engels 2005).

In the Netherlands, ecstasy emerged for the first time in the early 1980s. At that time, users explored the therapeutic qualities of ecstasy privately at home within small groups of close friends (Korf et al. 1991). The rave phenomenon hit the Netherlands in 1987 when the first underground ‘house parties’ were organised in abandoned warehouses. Shortly thereafter, in 1988, ecstasy was included as an illegal substance in the Opium Act in the Netherlands (Fromberg 1991). Despite its illegal status, ecstasy has firmly rooted as one of the favourite substances among the nightlife crowd during the last decade of the 20th century. Studies among partygoers in the 1990s revealed that 22 to 64 percent of them had consumed ecstasy the same night (Korf et al. 2004a; van de Wijngaart et al. 1997). In consequent years, legal, mainstream large-scale commercial dance events such as Dance Valley, Mysteryland, Awakenings and Sensation, marked the professionalization of the dance scene. Recently, however, the dance scene appeared to have reached the saturation point, which is reflected in a declining number of events and visitors (Nabben et al. 2007). While ecstasy use continued to decline since the start of the 21st century, the substance retains its position as popular party drug, next to alcohol, tobacco and cannabis.

Experiencing ecstasy

Ecstasy has both stimulant and mind-altering properties, although it mostly will not induce hallucinations. Users feel overwhelmed by a warm, peaceful sense of love and empathy and seem to
communicate more easily. The ecstasy high is characterised by feelings of openness and intimacy and a desire to connect with other people (prosocial effects). Due to these unique emotional and social properties, MDMA is pharmacologically classified as an entactogen. The term entactogen, derived from the roots ‘en’ (Greek: within), ‘tactus’ (Latin: touch) and ‘gen’ (Greek: generate), meaning ‘touching within’, was suggested by David Nichols (Nichols 1986). Several experimental studies – both in humans and animals - support the view that entactogens (MDMA, MDEA, MDA, MBDB) indeed constitute a distinct psychoactive substance class (Gouzoulis-Mayfrank et al. 1999). While LSD-like hallucinations are very uncommon, ecstasy users frequently report mild sensory distortions such as blurred vision, altered color perception, enhanced sense of touch and altered sound perception (Baylen & Rosenberg 2006). Ecstasy’s original image is that of a ‘hug drug’, an entactogenic substance that stimulates togetherness and intimacy and enhances tactile sensations, but without the desire for sexual activity (Vollenweider et al. 1998). However, studies suggest that some users consider ecstasy as an aphrodisiac (McElrath 2005; Sumnall et al. 2006; Theall et al. 2006). They reported that ecstasy increased sexual desire and contributed to sexual fulfilment and that they were more open to exploring new forms of sexuality, including bisexuality (McElrath 2005).

In a nutshell, ecstasy’s popularity as dance and party drug results from its stimulating properties and, most importantly, from the collective experience of joyful dancing, intensification of music perception and connectedness to other partygoers (Sumnall et al. 2006; ter Bogt & Engels 2005; van de Wijngaart et al. 1999). Negative emotional side effects are reported, such as anxiety, confusion, paranoia and lack of concentration. Physical side effects can include nausea, vomiting, headache, sweating, increased heart rate, blood pressure and body temperature, pupil dilation (mydriasis), thirst, muscle tightness, loss of appetite, teeth grinding (bruxism), jaw-clenching (trismus), dry mouth, insomnia, dizziness, rapid involuntary eye movements (nystagmus) and restlessness (Baylen & Rosenberg 2006). When the main effects of ecstasy have worn off, some users complain of physical and mental fatigue, low mood, irritability, sadness or depression. These feelings can last a few days, or, alternatively, manifest two or three days after ecstasy use (the ‘midweek blues’ of ‘Tuesday dip’). Conversely, others experience prolonged residual feelings of empathy and peacefulness, commonly referred to as ‘afterglow’ (Parrott & Lasky 1998). Recent research, however, suggests that depressed mood following ecstasy use may be due to sleep deprivation (Pirona & Morgan 2009).

Several studies suggest that many ecstasy users regard the benefits of use as outweighing potential negative effects (Bahoraa et al. 2009; Duff 2008; Hansen et al. 2001a; Hinchliff 2001; Murphy et al. 2006; Parks & Kennedy 2004; Rodgers et al. 2006; Shewan et al. 2000).

Ecstasy use rarely leads to acute health damage or death. Rare dangerous complications include hyperthermia and hyponatremia - most often the result of a combination of pharmacological properties of MDMA and the circumstances in which the drug is taken (most notably ambient temperature, water intake and physical activity) (Kerssemakers et al. 2008; Rogers et al. 2009). As such, ecstasy use only marginally contributes to drug-related death in general. According to the Netherland’s Central Bureau for Statistics, per year on average 4 persons die from the (mis)use of psychostimulants as primary cause of death (including amphetamine, ecstasy, caffeine, but excluding cocaine). In Germany and the United Kingdom, 20 and 48 people respectively die from ecstasy (mis)use every year, (van Laar et al. 2007a).

A number of studies have suggested that ecstasy use is associated with brain damage and memory disturbances (Gouzoulis-Mayfrank & Daumann 2006b). Currently, the neurotoxic and psychiatric risks of ecstasy use are intensely debated in the scientific community. A recent, thorough systematic review of the health effects of recreational ecstasy use indicates that significant neurocognitive
deficits (particularly immediate and delayed verbal recall) and psychopathological symptoms are associated with recreational ecstasy use. However, the clinical relevance for the individual remains uncertain since effect sizes are small and the test scores are still within the normal range. The authors conclude that it seems unlikely that these deficits cause major clinical or functional problems, or affect everyday functioning or quality of life for the majority of users (Rogers et al. 2009).

**Ecstasy market in the Netherlands**

The Netherlands are regarded as one of the main producer countries (Neve & Van Ooyen-Houben 2006). Ecstasy is most commonly taken in pill form, but also found as powder or crystals. A usual dose is between 50 and 150 mg MDMA. Since 1993 the Drugs Information and Monitoring System (DIMS), which is part of the Netherlands Institute of Mental Health and Addiction (Trimbos Institute), is coordinating the Dutch pill testing program (Vogels et al. 2009). The primary purpose of pill testing is monitoring the drug market (Korf et al. 2002). Since 1999, approximately. 90% of ecstasy tablets submitted to the pill testing service, contain MDMA. Contrary to popular belief, (meth)amphetamine is rarely found in ecstasy pills. In 2006 only 4% of ecstasy tablets contained (meth)amphetamine. An ecstasy tablet contained on average 74 mg MDMA in 2006. During the 1990s occasionally hallucinogens such as 2C-B and DOB were sold as ecstasy. National warning campaigns were launched in 1997-1998 and 2001-2002, in response to tablets adulterated with atropine and PMA, respectively (van Laar et al. 2007b; Vogels et al. 2009). Late 2008 and early 2009 the ecstasy market was deteriorated, with only about half of the tablets containing MDMA (Bosson et al. 2009). The most commonly used adulterant was mCPP (meta-chloro-phenylpiperazine) (Bosson et al. 2009).

Nowadays, on average 3 euro is paid for one ecstasy pill, which is considerably less than the price of 30 guilders (approximately 14 euro) at the beginning of the rave era (van Laar et al. 2007a). The declining price appears to be in contrast with the increased enforcement against ecstasy production and trade (Neve & Van Ooyen-Houben 2006).

Generally, users consume 1 to 2 tablets per occasion, 1 to 3 times a month. However, in the case of heavy users, it may amount to several pills (5-10) every weekend (ter Bogt & Engels 2005).

**Who is using ecstasy?**

Ecstasy is the most popular illegal drug other than cannabis in the Netherlands. The 2005 National Prevalence Survey, a large-scale Dutch nationwide household survey, reported that only 4.3% of the adult population (between the age of 15 and 65) has tried the substance at least once in their lives (Rodenburg et al. 2007). Thus, the majority of the population has never tried ecstasy. Just 0.4% (approx. 40,000 people) have taken ecstasy in the past month and accordingly, can be considered actual users. About one tenth (8.5%) of those that do have experience with this substance, have used it in the preceding month, suggesting that most often ecstasy use has a temporary character. A longitudinal study confirms that the majority of ecstasy users quit spontaneously at the age of 20-30 (von Sydow et al. 2002a). Mean age at first use (initiation) in the Netherlands is 22.2 years (Rodenburg et al. 2007).

Life time prevalence increased from 1997 to 2005: 2.3% in 1997 (Abraham et al. 1999), 3.2% in 2001 (Abraham et al. 2002) and 4.3% in 2005 (Rodenburg et al. 2007). However, the proportion of current (= last month) users remained stable: (0.3% in 1997 and 2001; 0.4% in 2005). Males (6.6%) have tried ecstasy more often than females (2.1%). According to the 2005 figures, ecstasy is most popular
among young adults: life time prevalence ranged from 5.1% at age 15-24 to 7.1% at age 25-44, while only 0.9% of those aged 45-64 have ever tried the substance. In urbanized areas, 9.6% of the adult population (between the age of 15 and 65) has taken ecstasy at least once, compared to 1.7% in non-urbanized areas (Rodenburg et al. 2007).

Ecstasy use is more prevalent among particular populations. The substance is especially popular among partygoers, most notably visitors of dance events and clubs, supporting ecstasy’s reputation as a party drug. In 1998 and 2003 patterns and trends in substance use among visitors of trendy clubs in Amsterdam were studied. In 1998, 41% had consumed ecstasy in the month preceding the questionnaire and 27% that same night, while figures in 2003 dropped to 19% and 8%, respectively. Interviews with a panel of insiders from the Amsterdam club- and dance scene confirmed this ‘ecstasy weariness’. People take the drug less often and more cautiously. This moderation of drug use (both in frequency and dosage) is dubbed ‘new sobriety’ by the researchers (Korf et al. 2004a; Nabben et al. 2007). Polydrug use is common among ecstasy users (Duff 2005; Gresch et al. 2005; Korf et al. 2004c; Scholey et al. 2004; Sherlock & Conner 1999; Theall et al. 2006) and is one of the most important confounds in research with recreational ecstasy users (Gouzoulis-Mayfrank & Daumann 2006a). Several studies indicate that most ecstasy users either study or are employed and participate in society, a process generally referred to as ‘normalisation’. Recreational drug use appears to be ‘increasingly integrated into the leisure and consumption landscapes of youth cultures’ (Duff 2005).

Recently, ecstasy gained popularity outside the traditional dance scene. Among visitors of trendy cafés and coffeeshops, respectively 7% and 23% had used ecstasy in the past month (Korf 2002; Nabben et al. 2006).

For homeless youth, school drop outs and detainees the figures range from 3% to 18% (Korf et al. 2004b; van Laar et al. 2007a).

The Netherlands rank high on the worldwide list of ecstasy life time prevalence. Take note that countries’ figures are difficult to compare, due to differences in methodology. Australia and the UK top the ranking: 8% to 10% of their adult population have tried ecstasy at least once. Next are the Netherlands, the US, Spain, Canada and Ireland with life time figures around 4-5%. In countries such as Germany and Italy about 2% has used ecstasy. In Denmark, Finland, Norway, Luxembourg and France ecstasy life time prevalence is as low as 1.5%. Finally, Greece (0.4%) and Sweden (0.2%) are at the bottom of the list (van Laar et al. 2007a).

Theories of drug use

Sociological, criminological and psychological theories can offer frameworks for the understanding of drug use. Social Learning Theory stresses the importance of the social environment in the learning process (Akers 1994; Bandura 1977; Sutherland 1947). Individuals learn new behaviours from observation, modelling and imitation of others, such as peers and family. Peers serve as influential role models, both by their own substance use and their attitudes toward substance use, which might contribute strongly to adolescent’s substance use behaviour (Petraitis et al. 1995). Other theories highlight individual decision-making processes. According to the Rational Choice Theory (Cornish & Clearccke 1986), people apply an informal cost-benefit analysis in which they weigh the expected advantages of substance use against their fear of physical, psychological or social harm. There is some evidence that substance use can be regarded as a rational decision process (Duffy & Ferguson 2007). Prochaska and DiClemente’s Transtheoretical Model of Change (1983) consists of five
successive stages: precontemplation, contemplation, decision-making, action and maintenance. It has been applied successfully in the study of substance use initiation (Coates et al. 1990; von Ungern-Sternberg et al. 2007). The Theory of Planned Behaviour (Ajzen 1991) argues that behaviour can be predicted by intentions to perform that behaviour. The behavioural intention itself is determined by three major components: attitude, which refers to the subject’s approval or disapproval of the behaviour; subjective norm, which relates to the perceived social approval from significant others; and perceived behavioural control, which concerns the perceived ease or difficulty of performing the behaviour (Umeh & Patel 2004). The theory of planned behaviour is one of the more widely used frameworks for understanding and predicting behaviour in social and health psychology (McMillan & Conner 2003), including the use of cannabis (Conner & McMillan 1999) and ecstasy (Orbell et al. 2001; Peters et al. 2008a; Umeh & Patel 2004).

Research has identified several risk factors for substance use initiation. Social and familial environmental factors, such as parenting style, parental and peer drug use and attitudes towards drugs use, play a strong role (Kokkevi et al. 2007; Martins et al. 2008a; von Sydow et al. 2002b). Certain personality traits and mental disorders have been implicated as risk factors. These include sensation seeking, rebelliousness, aggression, impulsivity, antisocial or delinquent behaviour, anxiety, ADHD and depression (for review see: Hawkins et al. 1992; Swadi 1999). Furthermore, substance use is influenced by genetic factors. Research indicates that while initiation is shaped predominantly by social and familial environmental factors, continuation, problem use and addiction are strongly influenced by genetic factors (Kendler et al. 2008).

Next, several studies have indicated that prior use of one substance can be a risk factor for initiating another (Kokkevi et al. 2007; Kostelecky 2005; Zimmermann et al. 2005). In addition, numerous studies have suggested that an early age of onset of tobacco, alcohol and/or cannabis use raises the probability of future drug use (Agrawal et al. 2006; Baumeister & Tossmann 2005; Kandel & Yamaguchi 1993; Kandel et al. 1992; Lyncskey et al. 2007; Reid et al. 2006). Other risk factors for substance use are availability of drugs (Beyers et al. 2004; von Sydow et al. 2002b), intention to use substances (Maddahian et al. 1988) and positive attitudes towards drug use (Martins et al. 2008b; von Sydow et al. 2002b). Additional influences on the risk of drug use are cultural norms, criminal laws and national drug policies (e.g. abstinence versus harm reduction approaches) (Beyers et al. 2004; Hawkins et al. 1992).

Aims and research questions

The studies presented in this thesis are substudies of the Netherlands XTC Toxicity Study (NeXT). An interdisciplinary team from the Academic Medical Centre of the University of Amsterdam (AMC), the University Medical Centre of Utrecht University (UMCU) and the Bonger Institute of Criminology at the University of Amsterdam investigated the causality, the course and the clinical relevance of the neurotoxicity of ecstasy and the social context and behavioural aspects of ecstasy use. Findings of the neuroimaging and neuropsychological assessments have been published elsewhere (de Win et al. 2008a; de Win et al. 2008b; de Win et al. 2007; de Win et al. 2006; Jager et al. 2008; Jager et al. 2007; Reneman et al. 2006; Schilt et al. 2008; Schilt et al. 2007a; Schilt et al. 2009; Schilt et al. 2007b).

The Bonger Institute conducted the social/criminological substudies of the NeXT Study. One of the main goals of the NeXT Study was to prospectively study a cohort of respondents who had never taken ecstasy before the study, but who were believed very likely to do so of their own accord during the course of the study. Therefore, the Bonger Institute recruited an exceptional group of respondents,
who also had to be willing and eligible to take part in strenuous medical and neuropsychological examinations, which proved a true challenge in the area of recruiting ‘hidden populations’. The prospective design of this study raised several specific ethical issues, the most important of which was whether the method might have encouraged subjects to take ecstasy.

The first research question is devoted to the methodological and ethical aspects of the prospective study. The other five research questions elaborate on the social context and various behavioural aspects of ecstasy use.

1. How to find future ecstasy users in an ethically sensitive context? Is it possible to develop a simple and practically feasible on-the-spot recruiting method?
2. What are the motives and reasons that young people have for not using ecstasy?
3. Can predictors of first-time ecstasy use be identified?
4. What is the role of peers in the initiation and continuation of ecstasy use?
5. What is the influence of long-term ecstasy use on the management of work and relationships?
6. What are the implications of these findings for drug prevention and education?

In order to answer these research questions, three samples were studied using questionnaires and face-to-face interviews:

1. A prospective sample of 188 respondents (age range 18-35, mean age 21.2 years) who had never taken ecstasy before the study, but who were believed very likely to do so of their own accord during the course of the study. Participants were examined using questionnaires, neuropsychological tests and neuroimaging techniques. This took place at baseline, when none of the participants had ever taken ecstasy, and throughout the course of the study, when some had started taking ecstasy and others had not. In this sample, the first three research questions are studied.

2. A sample of 106 ecstasy users (age range 18-39, mean age 25.4 years) with a lifetime ecstasy use frequency of 10 occasions or more, including at least once within 12 months prior to the interview. Lifetime ecstasy use varied from 14 to 560 occasions (mean 93.2, SD = 104.5) and lifetime number of pills taken varied from 7 to 3000 (mean 226.8, SD = 394.1). We sought variation in terms of age, in frequency and duration of ecstasy use, and in nightlife scenes. Data were collected in semi-structured, face-to-face interviews and a written questionnaire. The fourth research question is studied in this sample.

3. A sample of 29 long term heavy ecstasy users (age range 38–55, mean age 45). The lifetime number of pills taken varied from 250 to 5000 (mean 914, median 600). Data were collected in semi-structured in-depth face-to-face interviews focusing on patterns of ecstasy use and social functioning, and written questionnaires. This substudy investigated the fifth research question.

In order to answer the sixth research question, findings in all three samples were considered.
Outline

In this thesis, consisting of 8 chapters, we present the social/criminological substudies of the NeXT Study.

**Chapter 2** describes the methodology, sampling procedures and ethical aspects of the recruitment of the prospective cohort and the development of a simple and practically recruitment tool for finding potential ecstasy users.

In **Chapter 3** we study the motives and reasons that respondents of the prospective cohort report for not using ecstasy. We investigated by means of a factor analysis whether motivational patterns regarding non-use could be derived. Next, we determined whether motivational differences between future ecstasy users and persistent non-users already existed at baseline, when no subject had ever taken ecstasy.

In **Chapter 4** our aim is to identify predictors of first-time ecstasy use among young people at risk. We applied a multivariate survival analysis of a broad set of baseline predictors, according to Zinberg's model of drug-set-setting as a theoretical framework.

In **Chapter 5** the focus is on the role of peers in the initiation and continuation of ecstasy use. Do ecstasy users believe that peers play any part at all in their initiation or continuation of ecstasy use? We attempt to obtain better insights into the nature and dynamics of peer influence.

**Chapter 6** reports on an exploratory, largely qualitative study in which we interviewed 29 long-term heavy ecstasy users. We focused here on behavioural aspects of long-term, heavy ecstasy use, with particularly emphasis on occupational careers and intimate relationships.

**Chapter 7** summarizes the results of the presented studies. We discuss the implications of these findings in the context of drug prevention and education.

**Chapter 8** provides a summary and general discussion in Dutch.