ELSEVIER

Drug and Alcohol Dependence 55 (1999) 105–115

DRUG and ALCOHOL DEPENDENCE

Ecstasy use in Australia: patterns of use and associated harm

Libby Topp [a,*], Julie Hando [a], Paul Dillon [a], Ann Roche [b], Nadia Solowij [a]

[a] *National Drug and Alcohol Research Centre, University of New South Wales, Sydney, NSW 2052, Australia*
[b] *Queensland Alcohol and Drug Research and Education Centre, University of Queensland, Brisbane, Australia*

Received 26 May 1998; received in revised form 23 October 1998; accepted 17 November 1998

Abstract

This study explored patterns of ecstasy use and associated harm through the administration of a structured interview schedule to 329 ecstasy users, recruited from three Australian cities. A broad range of ecstasy users were interviewed, but on the whole, the sample was young, relatively well educated and most were employed or students. Patterns of use were varied, although extensive polydrug use was the norm. High rates of intravenous drug use were recorded, which may relate to an over-representation of chaotic intravenous polydrug users. Subjects had experienced an average of eight physical and four psychological side-effects, which they attributed to their ecstasy use in the preceding 6 months. Approximately 40% of the sample also reported financial, relationship and occupational problems. Young, female, polydrug users and those who binged on ecstasy for 48 h or more appeared most at risk of experiencing harm that they related to their ecstasy use. One-fifth of the sample had received treatment for an ecstasy-related problem, most often from a GP or natural therapist, and 7% were currently in treatment. One quarter wanted to reduce their use because of financial, relationship and psychological problems. A total of 15% wanted formal treatment for an ecstasy-related problem and 85% requested more information. These results have implications for the development of policies to respond to drug use among this population.

Keywords: Ecstasy; Patterns of use; Polydrug use; Harm; Intervention preferences

1. Introduction

The use of ecstasy[1] appears to be spreading in many parts of the world. Many European countries report increasingly high prevalence of use among young people, notably the UK, Germany, the Netherlands, Spain and some Central and Eastern European countries (Korf and Wurth, 1995; Griffiths et al., 1997; Pompidou Group, 1997). Australian surveys indicate that between 1990 and 1995, 1–3% of the general population used ecstasy (Commonwealth Department of Human Services and Health, 1994; Commonwealth Department of Health and Family Services, 1996). Use was most prevalent among younger users and females, with 9% of females aged 14–24 reporting use of ecstasy. In the US, there have been reports of marked increases in use in association with the 'rave' scene in San Francisco, Dallas, Houston, Miami and Denver (Miller, 1997). Between 1994 and 1995, the US Monitoring the Future Study recorded a significant increase in the prevalence of people aged between 19 and 28, who had used ecstasy in the last 12 months, from 0.7 to 1.6% (Johnston et al., 1997).

Early studies of ecstasy users found generally self-limiting patterns of use, low levels of injecting and few

* Corresponding author.

[1] Ecstasy' is preferred to MDMA (3,4-methylenedioxymethamphetamine) in this report as the term is now so widely used as to be considered virtually generic for any of the ring substituted amphetamine group. 'Ecstasy' may refer to MDMA, analogues of MDMA, or combinations of these (Griffiths et al., 1997). Current figures indicate that the ecstasy tablets available in Australia contain an average of 33% MDMA, but adulterants are rarely analysed (Hando et al., 1998). Pharmacological considerations are not discussed in detail due to the difficulties in determining the contents of tablets sold as 'ecstasy'.

0376-8716/99/$ - see front matter
PII: S0376-8716(99)00002-2

negative health effects (Solowij et al., 1992; Moore, 1993; Beck and Rosenbaum, 1994). The euphoric effects experienced during the first few use episodes soon diminished, perhaps due to rapid development of tolerance. As a result, many subjects discontinued use after several doses, or used intermittently to allow tolerance to dissipate. Relatively few associated problems were reported. For example, an Australian survey of 100 ecstasy users found that most adverse effects were unpleasant side-effects of acute use, such as loss of appetite, dry mouth, palpitations and bruxism (Solowij et al., 1992). Only two subjects reported feeling dependent on the drug. This study confirmed the results of studies conducted in the US (Peroutka et al., 1988; Beck, 1990; Peroutka, 1990; Beck and Rosenbaum, 1994). It provided support for suggestions that, while the pattern of ecstasy use remained one of intermittent oral administration, there was little cause for concern because use was usually self-limited and there were few extreme reactions or severe problems among users (Chesher, 1990; Solowij, 1993; Beck and Rosenbaum, 1994).

Such results thus seemed to confirm the prevailing view that ecstasy was a relatively benign substance with few associated problems (Nichols and Glennon, 1984; Downing, 1986; Fromberg, 1990). More recent research suggests that patterns of ecstasy use may be changing, with injecting becoming more prevalent, a wider range of drug use occurring in dance environments and a broader range of users using in a variety of settings (Green et al., 1995; Forsyth, 1996; Boys et al., 1997; Peters et al., 1997). Recently in the UK, Merrill (1996) described a group of ecstasy users who administered the drug repeatedly in increasing doses to overcome short-term tolerance. There have also been a growing number of deaths, in which ecstasy has been implicated (Henry et al., 1992; Solowij, 1993; White et al., 1997), although the reasons for extreme reactions are yet to be clearly delineated. Deaths have most often been attributed to heat stroke resulting from the circumstances in which ecstasy is used, such as dance venues (White et al., 1997). Some other deaths have been attributed to excessive water consumption (Cook, 1996; Matthai et al., 1996). Other research has noted significant psychological morbidity associated with the use of ecstasy (Cassidy and Ballard, 1994; McGuire et al., 1994; Series et al., 1994; Williamson et al., 1997).

Little systematic research on patterns of ecstasy use and perceptions of ecstasy-related harm has been conducted in Australia since the early 1990s. The present study aimed to:

1. examine the patterns of ecstasy and other drug use among a sample of current ecstasy users; and
2. examine subjects' perceptions of the incidence and nature of ecstasy-related harm.

2. Method

2.1. Recruitment

A total of 329 ecstasy users were interviewed in Australia's three largest cities: Sydney (64.7%); Brisbane (17.9%) and Melbourne (17.3%). Subjects were recruited through a purposive sampling strategy (Kerlinger, 1986), which included snowball procedures (61.3%), advertisements in local and entertainment newspapers (12.2%), interviewer contacts (11.3%), radio (7.9%), flyers (4.9%) and others (2.4%). 'Snowballing' (Biernacki and Waldorf, 1981) is a means of sampling 'hidden' populations which relies on peer referral and is widely used to access illicit drug users both in Australian (e.g. Solowij et al., 1992; Ovendon and Loxley, 1996; Boys et al., 1997) and international (e.g. Dalgarno and Shewan, 1996; Forsyth, 1996; Peters et al., 1997) studies. Contact was established with subjects via a radio interview and newspaper advertisements. Following interviews, subjects were asked whether they would be willing to tell their friends about the study. Those who agreed were given a bundle of business cards, which stated the name of the study and the researcher and listed contact details. Quotas were not set for the number and size of each 'snowball'.

2.2. Procedure

Subjects contacted the researchers by telephone and were screened for eligibility; criterion for entry was use of ecstasy at least three times in the preceding 12 months, including once in the past 6 months. Subjects were assured that all information provided was strictly confidential and anonymous and that the study would involve a face-to-face interview, which would take between 45 and 90 min. All subjects were volunteers who were reimbursed AUD$30 for their participation. Interviews took place in varied locations, agreed upon with the subjects and were conducted by interviewers trained in the administration of the interview schedule.

2.3. Measures

Subjects were administered a structured interview schedule designed specifically for the study, which was based on previous studies of ecstasy (Solowij et al., 1992) and amphetamine (Hando and Hall, 1993; Darke et al., 1994a; Hando et al., 1997) users. This focused on the 6 months preceding the interview and assessed: sample characteristics; ecstasy use history; routes of administration; other drug use history; physical and psychological side-effects of ecstasy; other ecstasy-related problems, including relationship, financial, legal and occupational problems; and help seeking behaviour.

2.4. Data analyses

For continuous, normally distributed variables, *t*-tests were employed and means reported. Where continuous variables were skewed, medians were reported and the Mann–Whitney *U*-test employed (Siegel and Castellan, 1988). Categorical variables were analysed using χ^2. Gender differences are noted when significant. To determine the variables independently associated with injecting ecstasy and desire to reduce ecstasy use, multiple logistic regressions were conducted. Odds ratios (OR) and 95% confidence intervals (CI) were calculated. Backwards elimination of variables was used to remove those variables not significantly predictive of outcome, as indicated by the Wald χ^2 (Hosmer and Lemeshow, 1989). To determine the variables independently associated with ecstasy-related harm, simultaneous multiple regressions were conducted. All analyses were conducted using SPSS for Windows™ Release 6.0 (Norusis, 1993).

3. Results

3.1. Sample characteristics

Half (51%) of the sample were female. The majority (92%) spoke English at home and the remainder represented 16 language backgrounds. A minority (2%) were of indigenous Australian descent. The mean age of the sample was 23.1 years (S.D. 5.6; range 15–46). Females were significantly younger than males (21.3 vs. 24.9 years, $t_{306} = 6.1$; $P < 0.001$). Few subjects had dependent children (5%).

Mean number of school years completed was 12.2 (S.D. 1.0; range 8–13). Half (49%) of the sample had completed courses after school, with 26% possessing a trade or technical qualification and 23% having completed a university degree or college course. One-third (35%) were presently employed full-time and a similar proportion (34%) were students. Smaller proportions were unemployed (16%), employed part-time or casually (15%), or engaged in home duties ($< 1\%$). A small minority (2%) had a previous conviction.

3.2. Ecstasy use

3.2.1. Patterns of ecstasy use

The median age at which subjects first tried ecstasy was 18 years (range 13–40), with a mean use duration of 3.6 years (S.D. 2.6; range 6 months to 13 years). Females began to use at a younger age than males (median 17 vs. 19 years, $U = 9683.5$, $P < 0.001$). Most (89%) of the sample had used ecstasy at least monthly at some time, at a median age of 19 years (range 13–39).

Subjects had used ecstasy on a median of 10 days in the preceding 6 months (range 1–100 days). Just over a third (37%) had used ecstasy on between 1 and 6 days, a further third (33%) had used on between 7 and 12 days, 19% had used on between 13 and 24 days and 12% had used on more than 24 days. Ecstasy was the preferred drug of half (50%) of the sample. The next most preferred drug was cannabis (12%), followed by amphetamine (12%), LSD (7%) and cocaine (5%).

The median number of ecstasy tablets taken in a 'typical' use episode was one (range 0.5–8) and 44% reported that they typically used more than one tablet. In their 'heaviest' use episode, subjects used a median of two tablets (range 0.5–30); 25% had taken four or more tablets in a single episode. One-third (35%) had 'binged' on ecstasy in the preceding 6 months, defined as using the drug on a continuous basis without sleep for 48 h or more (Ovendon and Loxley, 1996). The median length of longest binge was 3 days (range 2–14 days). Although there were no demographic differences between those who had and those who had not binged on ecstasy, those who had binged had used ecstasy on a significantly greater number of days in the preceding 6 months (median 16 vs. 8 days; $U = 6080.5$; $P < 0.001$) and used more ecstasy in both typical (1.75 vs. one tablet; $U = 8186.5$; $P < 0.001$) and heavy (three versus two tablets; $U = 6272.0$; $P < 0.001$) use episodes. They had used a wider range of drugs in their lifetime (11 versus ten, $t_{319} = -5.4$; $P < 0.001$) and in the last 6 months (nine versus seven; $t_{320} = -6.7$; $P < 0.001$).

3.2.2. Routes of administration

One-third (33%) of the sample had injected a drug. There was no difference in age or gender between those who had and those who had not injected a drug. Injectors had fewer years of education (12.0 vs. 12.4 years; $t_{327} = 2.3$; $P < 0.05$) and were more likely to be unemployed (24% vs. 13%; $\chi^2_1 = 6.9$; $P < 0.01$). They had used ecstasy on more days in the preceding 6 months (median 12 vs. 9 days; $U = 9895.5$; $P < 0.05$) and had used more ecstasy in their heaviest use episode (median three versus two tablets; $U = 9883.0$; $P < 0.05$). Injectors were less likely to nominate ecstasy as their favourite drug (41 vs. 55%; $\chi^2_1 = 5.3$; $P < 0.05$) and had used a wider range of drugs (12 vs. 9; $t_{326} = 10.0$; $P < 0.001$). Specifically, injectors were more likely to have ever used heroin (73.1 vs. 9%; $\chi^2_1 = 141.7$; $P < 0.001$) and to nominate heroin as their favourite drug (12 vs. 0.5%; Fisher's exact $P < 0.001$).

A total of 16% of the sample had injected ecstasy and 10% had done so in the preceding 6 months. The median age of first injection of ecstasy was 20 years (range 15–40). Ecstasy was the first drug injected for only a minority (4%) of the injectors, most having commenced injecting with amphetamine (59%) or heroin (20%). In the preceding 6 months, almost all

Table 1
Patterns of drug use of the 329 ecstasy users in the study

Drug class	Ever used (%)	Used last 6 months (%)	No. days used last 6 months (median)[#]
Ecstasy	100	100	10
Alcohol	99.7	93.6	24
Cannabis	98.8	92.1	48
Amphetamine	94.2	81.8	10
LSD	93.3	68.1	4
Tobacco	85.4	74.8	180
Amyl nitrate	75.4	46.5	3
Cocaine	61.4	40.7	2
Nitrous oxide	61.1	35.3	4
Benzodiazepines	56.8	43.2	5.5
MDA	50.5	31.3	3
Other opiates	32.0	20.7	3
Heroin	30.1	17.3	12
Antidepressants	23.1	13.4	6
Ketamine	18.2	10.0	4
Ethyl chloride	10.0	5.8	2
Methadone	7.3	2.7	20
Anabolic steroids	4.3	1.5	20
GHB	2.7	1.8	1.5
Other drugs*	–	5.2	2

[#] Among those who had used.
* Other drugs included hallucinogenic mushrooms, DMT and 2CB.

(99%) of the sample had swallowed ecstasy; 30% had snorted it; and 12% had smoked ecstasy mixed with cannabis. Most subjects nominated swallowing as their main route of ecstasy administration (94%), followed by injecting (3%) and snorting (2%). Multiple logistic regressions indicated that the only variable independently associated with having injected ecstasy was having injected a wider range of drugs other then ecstasy (OR 3.9; CI 2.7–5.7). This model was significant ($\chi^2 = 69.5$; $P < 0.001$) and correctly classified 91% of the sample.

Among those who had injected ecstasy (16%; $n = 54$), reported reasons for trying injecting included: curiosity (74%), the rush/high (62%), friends were injecting (50%), they liked needles (34%), injecting was considered more economical (28%), or injecting was considered better, easier or quicker (16%). Three-quarters (74%; $n = 39$) of those who had injected ecstasy had switched back to oral/intranasal administration at some time. Reasons for this included: health problems (54%), the inconvenience of injecting (20%), feeling dependent on ecstasy (17%), coming down too intensely (17%), friends not injecting (14%) and the effects were too intense to enjoy (11%).

3.3. Other drug use

Polydrug use was the norm among this sample (Table 1) with a mean of ten drugs (SD 2.6, range 2–17) having been tried. In the preceding 6 months, these were most frequently ecstasy, alcohol, cannabis and amphetamine. More than one-third (42%) of the sample had 'binged' on one or more party drugs in the preceding 6 months, including amphetamine (36% of the sample), LSD (13%), nitrous oxide (7%), amyl nitrate (5%), cocaine (5%) and MDA (3%).

Most subjects typically (i.e. at least two-thirds of the time) used other drugs in combination with ecstasy (93%) and in the 'come down' (i.e. acute recovery period) after using ecstasy (87%). The drugs typically used in conjunction with ecstasy were tobacco (62% of the sample), cannabis (45%), amphetamine (43%), alcohol (40%), LSD (13%), amyl nitrate (12%) and nitrous oxide (7%). Of those who typically drank alcohol while using ecstasy, 41% usually consumed more than five standard drinks. The drugs typically used when coming down from ecstasy were cannabis (64%), tobacco (54%), alcohol (21%), benzodiazepines (17%), nitrous oxide (8%), amphetamine (7%) and heroin (5%).

3.4. Physical and psychological side-effects

Tables 2 and 3, respectively, display the physical and psychological side-effects attributed to ecstasy in the preceding 6 months and their duration and perceived origins among those who reported them. Subjects reported a mean of eight physical side-effects in the preceding 6 months (S.D. 4.2; range 0–20). The most common were energy loss, muscular aches, hot/cold flushes and blurred vision. A mean of four psychological side-effects (S.D. 2.4; range 0–13) were also reported, most often irritability, trouble sleeping,

Table 2
Physical side-effects of ecstasy ($N = 329$)[a]

Symptoms	Last 6 months (%)	While using ecstasy*	While coming down*	At other times*	Median length of worst case #	Only related to ecstasy #
Loss of energy	64.9	7.7	61.2	19.4	2 days	46.0
Muscular aches	59.9	10.7	57.6	11.6	2 days	34.7
Hot/cold flushes	48.0	39.2	25.5	4.9	1 h	52.5
Blurred vision	47.1	45.9	12.5	4.0	1 h	69.0
Numbness/tingling	45.6	42.2	14.9	6.4	1 h	59.3
Profuse sweating	42.6	38.9	18.0	4.9	3 h	40.6
Weight loss	42.6				21 days	26.1
Dizziness	41.9	31.0	21.3	9.7	20 min	46.4
Tremors/shakes	41.9	30.1	25.2	8.8	2 h	46.4
Heart palpitations	40.7	37.1	16.1	7.6	30 min	38.8
Headaches	40.4	11.2	35.3	7.9	4 h	35.3
Stomach pains	37.7	25.5	22.8	6.4	2 h	48.0
Joint pains/stiffness	35.0	7.9	33.4	7.6	2 days	31.3
Inability to urinate	34.7	34.3	5.8	1.5	3 h	77.9
Vomiting	33.9	30.0	7.6	5.5	5 min	64.9
Teeth problems	33.1	15.2	23.2	12.2	2 days	44.0
Shortness of breath	26.4	22.8	6.7	2.1	30 min	34.5
Blackout/memory lapse	24.9	14.3	12.8	3.2	3 h	31.3
Chest pains	15.8	8.8	9.4	4.9	1 h	25.0
Fainting/pass out	6.4	4.9	1.8	1.5	3.5 min	47.6
Fits/seizures	(3)	(2)	(2)	0	30 s	(1)

[a] Figures in brackets refer to ns.
* Proportion of total sample.
# Among those reporting the symptom.

depression and confusion. Females reported more physical (eight versus seven; $t_{320} = -4.0$; $P < 0.001$) and psychological (five versus four; $t_{326} = -3.3$; $P < 0.05$) side-effects than males. There was no difference in number of ecstasy-related side-effects according to injection status, but those who had binged on ecstasy reported more physical (nine versus seven; $t_{344} = -5.3$; $P > 0.001$) and psychological side-effects (five versus four; $t_{319} = 3.6$; $P < 0.001$).

Side-effects were generally acute symptoms experienced while either intoxicated or coming down. The most common side-effects experienced while intoxicated were blurred vision, numbness/tingling, hot/cold flushes and profuse sweating. Common symptoms experienced while coming down included energy loss, irritability, muscle aches and trouble sleeping. Significant minorities reported symptoms extending beyond the acute intoxication and recovery period, including weight loss, depression, irritability, energy loss, trouble sleeping, anxiety and teeth problems (e.g. bruxism, hypersensitive teeth, mouth ulcers from excessive chewing). Small proportions reported extreme reactions such as seizures, violent behaviour or suicidal thoughts (Tables 2 and 3).

Symptoms usually attributed solely to ecstasy use included: inability to urinate, blurred vision, vomiting, numbness/tingling, sound hallucinations, confusion, loss of sex urge, hot/cold flushes, visual hallucinations and flashbacks. Other symptoms were perceived as caused by ecstasy use combined with other factors, such as polydrug use, lack of sleep, pre-existing conditions and sustained exertion (Tables 2 and 3).

Multiple linear regressions were performed to determine the variables independently associated with number of side-effects attributed to ecstasy. Variables entered into the models included demographic variables, indicators of ecstasy, amphetamine and cocaine use, route of administration variables and extent of recent polydrug use. The final model predicting physical side-effects indicated that being female ($\beta = 1.6$; $P < 0.001$), being younger ($\beta = -0.20$; $P < 0.001$), number of drugs typically used when recovering from ecstasy ($\beta = 0.88$; $P < 0.001$), recent bingeing on ecstasy ($\beta = 1.4$; $p < 0.005$), quantity of ecstasy typically used ($\beta = 0.52$; $P < 0.01$) and unemployment ($\beta = -1.2$; $P < 0.05$) were independently associated with more physical side-effects. This model was significant ($F_{6309} = 20.0$, $P < 0.001$), accounting for 29% of the

Table 3
Psychological side-effects of ecstasy ($N = 329$)[a]

Symptom	Last 6 months (%)	While using ecstasy*	While coming down*	At other times*	Median length of worst case #	Only related to ecstasy (%) #
Irritability	61.9	3.4	59.8	20.4	2 days	46.8
Trouble sleeping	55.9	23.1	52.0	16.1	12 h	43.2
Depression	55.6	4.6	49.8	24.3	3 days	49.7
Confusion	47.4	30.4	35.6	10.6	12 days	53.2
Anxiety	45.0	26.7	32.5	14.0	4 h	45.9
Paranoia	40.4	22.2	30.7	10.9	3 h	39.8
Visual hallucinations	28.0	27.1	8.2	5.5	1.5 h	52.2
Sound hallucinations	20.7	18.5	7.3	3.3	45 min	54.4
Flashbacks	14.6	0	4.9	12.2	5 min	52.1
Panic attacks	12.8	10.0	4.6	4.0	1 h	42.9
Loss of sex urge	12.2	8.2	7.6	5.2	24 h	52.5
Suicidal thoughts	10.3	(2)	8.2	6.7	24 h	26.5
Violent behaviour	(9)	(2)	(5)	(5)	60 min	(2)
Suicide attempts	(3)	0	(1)	(2)	–	0

[a] Figures in brackets refer to ns.
* Proportion of total sample.
# Among those reporting the symptom.

variance. The final model predicting psychological side-effects indicated that being female ($\beta = 0.91$; $P < 0.001$), number of drugs typically used when recovering from ecstasy ($\beta = 0.41$; $P < 0.001$), more extensive recent polydrug use ($\beta = 0.15$; $P < 0.05$) and recent bingeing on stimulants ($\beta = 0.58$; $P < 0.05$), were all associated with more psychological side-effects. This model was significant ($F_{4315} = 14.9$, $P < 0.001$), but accounted for a relatively small proportion of variance (16%).

3.5. Other ecstasy-related problems

More than one-third (42%) of the sample had experienced occupational problems in the preceding 6 months, which they related to their ecstasy use. A higher proportion of females reported work or study problems (50 vs. 34% of males; $\chi^2_1 = 9.0$; $P < 0.01$). Most (64%) of the problems involved trouble concentrating, reduced performance or feeling unmotivated. A quarter (25%) involved taking sick leave or not attending classes, while a minority (11%) were serious problems such as being dismissed from or quitting a job, or inability to obtain employment.

Forty percent of the sample reported ecstasy-related relationship problems in the preceding 6 months, three-quarters (77%) of which were relatively minor, such as arguments, mistrust or anxiety. Minorities reported more serious problems like ending a relationship (19%), being forced to leave home (2%) or violence (2%). Financial problems related to ecstasy were also common (38%). Half (47%) of these were relatively minor, such as having no money for other recreation, although 28% reported being in debt and 25% had been unable to pay for essentials such as food or rent. Only a minority (3%; $n = 9$) of the sample had recent legal problems related to ecstasy. Of these, six subjects had been cautioned and three had been arrested.

Injection status did not affect the likelihood of reporting ecstasy-related financial, occupational or relationship problems. Those who had binged on ecstasy were more likely than those who had not binged to report financial (54 vs. 31%; $\chi^2_1 = 16\ 2$; $P < 0.001$), occupational (52 vs. 36%; $\chi^2_1 = 7.1$; $P < 0.01$) and relationship (57 vs. 32%; $\chi^2_1 = 19.1$; $P < 0.001$) problems which they attributed to their use of ecstasy.

An index of total ecstasy-related problems was calculated by adding together the number of different problems reported (occupational, social, financial and legal). Mean number of problems experienced was 1.2 (S.D. 1.1; range 0–4). Multiple linear regressions indicated that being younger ($\beta = -0.06$; $P < 0.001$), significant tolerance to ecstasy ($\beta = 0.69$; $P < 0.001$), frequency of recent ecstasy use ($\beta = 0.01$; $P < 0.01$) and recent bingeing on ecstasy ($\beta = 0.25$; $P < 0.05$) were independently associated with extent of problems. This model was significant ($F_{4315} = 30.8$, $P < 0.001$), accounting for 28% of the variance.

3.6. Help seeking behaviour

One fifth of the sample (22%; $n = 71$) had received formal assistance from a health practitioner for an ecstasy-related problem (Table 4), although in the ma-

Table 4
Responses sought to modify ecstasy use or reduce associated problems ($N = 329$)

	Ever received % (n)	Current intervention % (n)	Presented as ecstasy-related (%) #	% Reduced ecstasy use #	% Satisfied #,*
Formal					
General medical practitioner	11.2 (37)	2.1 (7)	78.4	18.9	67.6
Natural therapies	7.6 (25)	3.3 (11)	44.0	40.0	96.0
Counsellor	4.0 (13)	<1 (2)	92.3	53.8	61.5
First aid	2.7 (9)	–	88.9	11.1	100
Psychiatrist	2.7 (9)	<1 (2)	55.6	44.4	44.4
Casualty	2.4 (8)	–	100	12.5	62.5
Detoxification programs	<1 (3)	0	100	66.7	100
Narcotics anonymous	<1 (3)	<1 (1)	100	100	100
Therapeutic community	0	–	–	–	–
Informal					
Alone	41.2 (136)	34.7 (114)	87.8	90.8	
Social support	17.6 (58)	12.2 (40)	91.4	51.7	96.6
Information	40.4 (133)	–	–	9.0	57.6

Among those who participated in the intervention.
* Includes subjects who were moderately to extremely satisfied.

jority of these cases ($n = 58$), other drugs were also involved. The most common services accessed were general practitioners (GPs; 11%) or natural therapists (8%), with which there was a high degree of satisfaction (Table 4). Small numbers had consulted counsellors ($n = 13$) or psychiatrists ($n = 9$); received first aid at a venue ($n = 9$); or presented to a hospital accident and emergency department ($n = 8$). Seven percent of the sample ($n = 23$) were presently receiving treatment for an ecstasy-related problem, most frequently from a natural therapist ($n = 11$) or GP ($n = 7$) (Table 4). Attempts to modify ecstasy use without formal assistance were common (46%; $n = 152$), with many subjects having done so alone (41%; $n = 136$) and/or with support from family or friends (18%; $n = 58$) (Table 4).

A quarter (25%) of the sample currently wanted to reduce their ecstasy use, including seven subjects (2%) who wanted to quit using altogether. The most common reasons were: financial difficulties (57%; $n = 47$), physical health effects (45%; $n = 37$), psychological problems (39%; $n = 32$), occupational problems (37%; $n = 31$), to improve their quality of life (28%; $n = 23$), relationship problems (17%; $n = 14$) and feeling dependent on ecstasy (16%; $n = 13$). Multiple logistic regressions indicated that the variables independently associated with desire to reduce ecstasy use were financial problems (OR 2.2, CI 1.2–3.9), relationship problems (OR 2.2, CI 1.2–3.9), more psychological side-effects (OR 1.2, CI 1.1–1.4) and more frequent use (OR 1.1, CI 1.0–1.2). This model was significant ($\chi^2_4 =$ 75 8; $P < 0.001$) and correctly classified 80% of the sample.

Fifteen percent ($n = 49$) of the sample wanted formal treatment for an ecstasy-related problem. The most common request was for natural therapies, particularly advice on diet and nutrition (10%; $n = 32$), followed by consultation with a counsellor (4%; $n = 1$ 3), GP (3%; $n = 11$) or psychiatrist (2%; $n = 6$). Most subjects (85%) requested more information about ecstasy, particularly on side-effects (49%), harm reduction techniques (49%), long-term effects (34%), mode of action (29%), manufacturing processes and contents (26%), recommended water consumption (24%) and strategies for cutting down (13%). Half the sample (50%) thought that the provision of drug testing facilities might minimise problems from impurities.

4. Discussion

This study involved in-depth interviews with a wide cross section of 329 users from three Australian cities and revealed their perceptions of a diverse range of ecstasy-related harm. Young, female polydrug users and those that binged on ecstasy for 48 h or more appeared particularly at risk of experiencing harm that they attributed to their ecstasy use. The limitations of 'snowball' sampling, however, dictate that the generalising of these findings to the wider population of ecstasy users be assessed with caution. As with any group of illicit drug users, it is impossible to define the parameters of the population and therefore, to randomly sample that population. It is, thus, possible that the sample was not representative of ecstasy users as a whole.

In particular, the rate of intravenous drug use (33%) appears high, although another Australian study (Lenton et al., 1997) also reported that 33% of a sample of 83 'ravers' had injected. Reports of dance scene

participants from the UK have found that, although injecting is somewhat taboo, small proportions engage in this practice (e.g. Newcombe, 1992; McDermott, 1993; Forsyth, 1996). Although there was no difference in age and gender between those who had and those who had not injected a drug, injectors had fewer years of education, were more likely to be unemployed, used a wider range of drugs and, in particular, were more involved in heroin use. It is possible that the present sample may over-represent chaotic intravenous drug users, for whom ecstasy was merely part of extensive polydrug use repertoires. As injectors were no more likely than non-injectors to report ecstasy-related problems, the high incidence of problems cannot be accounted for by the recruitment of a seemingly high proportion of intravenous drug users.

A broad range of ecstasy users participated in this study, but on the whole, the sample was young, relatively well educated, most were employed or students and males and females were equally represented. A variety of cultural backgrounds were represented, including a minority of subjects of indigenous descent. The majority of the sample had not had contact with police or social authorities and did not come from socially deprived backgrounds. However, the early American studies, which suggested that ecstasy use was largely confined to well educated, high income earners, with patterns of intermittent ecstasy use (e.g. Peroutka et al., 1988; Beck and Rosenbaum, 1994), bear little resemblance to the findings of the present study and more recent reports from Europe and the UK (e.g. McDermott, 1993; Forsyth, 1996; van Laar and Spruit, 1997; Williamson et al., 1997). These have depicted a broad range of users engaging in regular ecstasy use and extensive polydrug use.

Subjects typically began to use ecstasy in their late teens, an earlier age than reported in studies conducted in the UK (e.g. Forsyth, 1996; Williamson et al., 1997), which found use was initiated in the early to late 20s, but equivalent to a report from Italy (Schifano et al., 1998). Current frequency of use varied from once in 6 months to 4 days per week. A quarter of the sample had consumed four or more tablets in a use episode in the preceding 6 months, with a maximum of 30 tablets consumed in a weekend 'binge' by one subject. More than one-third of the sample had binged on ecstasy for 48 h or more. This contrasts with the report of Winstock (1991) that only 'a minority' of his sample of 89 ecstasy users engaged in such binges. Compared to those who had not binged on ecstasy, the bingers used more ecstasy more frequently, had experimented with a wider range of other drugs and were more likely to report physical, psychological, occupational, financial and relationship problems which they related to their use of ecstasy. Multivariate analyses, which held the effects of the use of other drugs constant, indicated that bingeing was independently associated with all measures of ecstasy-related harm.

Consistent with earlier reports (e.g. Solowij et al., 1992; Williamson et al., 1997), use of ecstasy was primarily through oral routes, but a substantial proportion (16%) of the sample reported injecting ecstasy. Multivariate analyses suggested that this practice was an extension of the intravenous use of other drugs. This is consistent with findings from the UK, that ecstasy injecting is increasing among intravenous drug users (Green et al., 1995; Peters et al., 1997) and with the possibility that this sample may over-represent intravenous drug users. The adverse health and psychological implications of injecting ecstasy have been highlighted elsewhere (Hunt et al., 1993), as for the intravenous use of other stimulants (Hall and Hando, 1994). Most of those who had injected ecstasy had reverted back to oral/intranasal use. Reasons for changes in routes of administration were similar to those reported by amphetamine users (Darke et al., 1994a).

As with other samples of 'dance drug' users (e.g. Forsyth, 1996; Boys et al., 1997; Release, 1997), it is accurate to characterise this sample as extensive polydrug users, half of whom had a preference for ecstasy. Consistent with earlier reports (e.g. Schifano et al., 1998), substantial minorities of the sample regularly used amphetamine, alcohol, LSD, amyl nitrate and nitrous oxide concurrently with ecstasy, emphasising the need for research and education on the effects of polydrug use. Many subjects typically used drugs such as cannabis, alcohol and benzodiazepines to ease the 'come down' period after using ecstasy, suggesting that the sample was adept at obtaining drugs to self-medicate the adverse physical and psychological effects of ecstasy (and other drug) use. This is of concern, as the 'stimulant–depressant' cycle of use has been associated with more adverse effects than stimulant use alone (Williamson et al., 1997). The high rate (57%) of benzodiazepine use was disturbing, given suggestions that benzodiazepines may act as a 'bridge' between problem drug users and the dance scene (Forsyth, 1996). Further, amphetamine users who also use benzodiazepines report higher levels of polydrug use and psychopathology, poorer health and social functioning and greater HIV risk-taking than those who do not (Darke et al., 1994b).

On average, subjects reported eight physical and four psychological side-effects which they perceived as being due, at least in part, to their use of ecstasy. Although the symptoms were consistent with side-effects described in earlier reports (e.g. Hayner and McKinney, 1986; Cohen, 1995; Curran and Travill, 1997; van Laar and Spruit, 1997; Williamson et al., 1997), higher proportions of the present sample had experienced them. Whereas, most psychological symptoms were perceived

to stem from a combination of ecstasy and other factors, such as polydrug use, sustained exertion, lack of sleep or pre-existing conditions, many physical symptoms were perceived by most of those who reported them as due solely to ecstasy use. Multivariate analyses supported subjects' perceptions of causality. Extent of physical symptomatology was best predicted by being young and female, along with indices of ecstasy use including quantity, bingeing and extent of polydrug use during the recovery period. The multivariate model predicting psychological symptoms did not have strong predictive power, but indicated that polydrug use was important in accounting for variance in outcome. Other reports have also indicated that more extensive polydrug use is associated with greater levels of harm (e.g. Newcombe, 1992; Williamson et al., 1997).

Ecstasy-related occupational, relationship and financial problems were frequently reported. Although many of these were relatively minor, some constituted significant disruptions to functioning, including loss of employment, ending relationships and inability to pay for food or rent. Few studies have depicted ecstasy-related functional impairment, although McDermott (1993) described a network of ecstasy users who also experienced occupational, relationship and financial problems related to their use. That the problems reported by the present sample were ecstasy-related was supported by multivariate analyses, which indicated that the extent of such problems was best predicted by ecstasy use variables. Indices of other drug use and, in particular, other stimulant use, did not add significant predictive power to the model.

The data collected for this study were cross-sectional rather than longitudinal, thus, preventing the drawing of causal inferences (Lilienfeld and Lilienfeld, 1980). In particular, the harm reported by subjects was perceived as related to their ecstasy use, but, within the constraints of the cross-sectional design, it was impossible to validate the reported harm against objective criteria, or to disentangle the multitude of possible causal factors. Given the extent of polydrug use among the sample, it might be difficult for subjects to attribute drug-related symptoms specifically to ecstasy. It is possible that polydrug users have problems with their drug use in general and that they may answer questions about their drug use in general even when questions relate to a specific drug. Nonetheless, the consistency between the side-effects reported by the present sample and those described in earlier studies, combined with the statistical control afforded by multiple linear regression (Hall, 1987), increases the confidence that the side-effects reported were related, at least in part, to ecstasy use.

An important predictive factor in ecstasy-related harm was the youth of the user. Being younger was independently associated with two of the three measures of ecstasy-related harm (physical side-effects and extent of total harm). There was no relationship between age and quantity or frequency of ecstasy use. Similarly, Chen et al. (1997) found that at the same intensity of cannabis use, adolescent users were more likely to meet criteria for dependence than adults. They speculated that adolescents may be more vulnerable than adults to the social and psychological consequences of cannabis use. These findings may extend to ecstasy and to young adults, in that the younger users in the present sample appeared more vulnerable to harm associated with ecstasy use. Although the non-random nature of this sample necessitates caution in assessing the generalisability of these results, it is possible that young people who binge on ecstasy may experience psychological, physical, occupational, relationship and financial impairment related to their drug use.

A quarter (25%) of the sample currently wanted to reduce their use of ecstasy. Multivariate analyses indicated that desire to reduce ecstasy use was independently associated with financial, relationship and psychological problems and more frequent use. In contrast, a sample of users in the UK reported that their main reasons for reduced ecstasy use were cost issues, reduced novelty and decreased quality (Williamson et al., 1997). This suggests that the present sample may have been more affected by the adverse effects associated with use, although varying methodologies may account for these differences. Fifteen percent of the sample indicated a desire for formal treatment for an ecstasy-related problem and the majority requested more information about ecstasy, pointing to the distinct lack in Australia of resources that target this population. Moreover, half the sample recommended that drug testing facilities, similar to those operating in the Netherlands (Institute for the Study of Drug Dependence, 1998; Levine, 1994), be provided at dance venues to minimise the risks from impurities.

5. Conclusion

Contrary to predictions that ecstasy use was a 'fad' which would quickly be superseded by some other substance (Solowij et al., 1992) and the common belief that oral, intermittent use was the predominant pattern and of little concern (Chesher, 1990; Solowij, 1993; Beck and Rosenbaum, 1994), the present results have demonstrated that there are significant hazards associated with some patterns of ecstasy use. In particular, young, female, polydrug users and those who binged on ecstasy were most likely to report physical, psychological, financial, relationship and occupational problems which they attributed, at least in part, to their ecstasy use. These findings stand in contrast to the conventional wisdom that ecstasy is a relatively benign drug

with few associated risks (Nichols and Glennon, 1984; Downing, 1986; Fromberg, 1990). Although this non-random sample may not be representative of the wider population of ecstasy users, the results nevertheless demonstrate that a subset of users may benefit from the dissemination of credible information to help modify their use patterns and reduce the associated problems. Further, treatment options should be developed and evaluated to meet the demand clearly indicated by the present results. Many subjects expressed interest in treatments to help them to minimise the adverse side-effects of ecstasy, but one-quarter of the sample currently wanted to reduce their ecstasy use and substantial minorities referred to the need for specific treatments to assist them in doing so.

Acknowledgements

This study was funded by a research grant from the National Initiatives in Drug Education, Commonwealth Department of Health and Family Services and by Queensland Health. The authors would like to thank Steven Crocker and Mary Shire from the CDHFS, Wayne Hall for overseeing the project to its fruition, Michael Lynskey for statistical advice and Louisa Degenhardt and anonymous reviewers for helpful comments on this paper. Clinton Kempnich, Suzanne Miller, Nicole Lee and John Fitzgerald assisted with the data collection.

References

Beck, J., 1990. The public health implications of MDMA use. In: Peroutka, S.J. (Ed.), Ecstasy: the clinical, pharmacological and neurotoxicological effects of the drug MDMA. Kluwer, Boston, pp. 77–103.

Beck, J., Rosenbaum, M., 1994. Pursuit of ecstasy: the MDMA experience. State University of New York Press, Albany, NY.

Biernacki, P., Waldorf, D., 1981. Snowball sampling: Problems, techniques and chain referral sampling. Soc. Methods Res. 10, 141–163.

Boys, A., Lenton, S., Norcoss, K., 1997. Polydrug use at raves by a Western Australian sample. Drug Alcohol Rev. 16, 227–234.

Cassidy, G., Ballard, C.G., 1994. Psychiatric sequelae of MDMA (ecstasy) and related drugs. Ir. J. Psychol. Med. 11, 132–133.

Chen, K., Kandel, D., Davies, M., 1997. Relationships between frequency and quantity of marijuana use and last year proxy dependence among adolescents and adults in the United States. Drug Alcohol Depend. 46, 53–67.

Chesher, G.B., 1990. Designer drugs—the 'whats' and the 'whys'. Med. J. Aust. 153, 157–161.

Cohen, R.S., 1995. Subjective reports on the effects of the MDMA ('ecstasy') experience in humans. Prog. Neuropsychopharmacol. Biol. Psychiat. 19, 1137–1145.

Commonwealth Department of Human Services and Health, 1994. Statistics on drug abuse in Australia, 1994. Australian Government Publishing Service, Canberra.

Commonwealth Department of Health and Family Services, 1996. National Drug Household Survey: Survey Report 1995. Australian Government Publishing Service, Canberra.

Cook, T.M., 1996. Cerebral oedema after MDMA ('ecstasy') and unrestricted water intake. Br. Med. J. 313, 689.

Curran, H.V., Travill, R.A., 1997. Mood and cognitive effects of +3,4-methylenedixoymethamphetamine (MDMA, 'ecstasy'): weekend 'high' followed by mid-week low. Addict 92, 821–831.

Dalgarno, P.J., Shewan, D., 1996. Illicit use of ketamine in Scotland. J. Psychoactive. Drugs 28, 191–199.

Darke, S., Cohen, J., Ross, J., Hando, J., Hall, W., 1994a. Transitions between routes of administration of regular amphetamine users. Addict 89, 1077–1083.

Darke, S., Ross, J., Cohen, J., 1994b. The use of benzodiazepines among regular amphetamine users. Addict 89, 1683–1690.

Downing, J., 1986. The psychological and physiological effects of MDMA on normal volunteers. J. Psychoactive Drugs 18, 335–340.

Forsyth, A.J.M., 1996. Places and patterns of drug use in the Scottish dance scene. Addict 91, 511–521.

Fromberg, E., 1990. XTC: A new soft drug. Tijdschr Alcohol Drugs Andere Psychotrope Stoffen 16, 150–158 (Abstract only).

Green, S.T., Frischer, M., Taylor, A., Goldberg, D.J., McKeganey, N., Bloor, M., 1995. Increasing ecstasy use among Glasgow drug injectors. Addict. Res. 3, 73–76.

Griffiths, P., Vingoe, L., Jansen, K., Sherval, J., Lewis, R., Hartnoll, R., Nilson, M. (Eds.), 1997. New trends in synthetic drugs in the European Union: epidemiology and demand reduction responses. EMCDDA Insights Series, Number 1. EMCDDA, Portugal.

Hall, W., 1987. A simplified logic of causal inference. Aust. New Zealand J. Psychiat. 21, 507–513.

Hall, W., Hando, J., 1994. Route of administration and adverse effects of amphetamine use among young adults in Sydney, Australia. Drug Alcohol Rev. 13, 277–284.

Hando, J., Hall, W., 1993. Amphetamine use among young adults in Sydney, Australia. NSW Health Department Drug and Alcohol Directorate Research Grant Report Series, B93/2. NSW Health Department, Sydney.

Hando, J., Topp, L., Hall, W., 1997. Amphetamine-related harms and treatment preferences of regular amphetamine users in Sydney, Australia. Drug Alcohol Depend. 46, 105–113.

Hando, J., Darke, S., Degenhardt, L., Cormack, S., Rumbold, G., 1998. A comparison of drug use and trends in three Australian States: results from a national trial of the Illicit Drug Reporting System. National Drug and Alcohol Research Centre Monograph No. 36. NDARC, Sydney.

Hayner, G.N., McKinney, H., 1986. MDMA: the dark side of ecstasy. J. Psychoactive Drugs 18, 341–347.

Henry, J.A., Jeffreys, K.L., Dawling, S., 1992. Toxicity and deaths from 3,4-methylenedioxymethamphetamine ('Ecstasy'). Lancet 340, 384–387.

Hosmer, D.W., Lemeshow, S., 1989. Applied logistic regression. Wiley, New York.

Hunt, N., Jones, K., Shelley, H., 1993. What happens when ecstasy is injected? (letter). Int. J. Drug Policy 4, 161–162.

Institute for the Study of Drug Dependence, 1998. How blue was my ecstasy? Druglink 13 (March/April), 5.

Johnston, L.D., O'Malley, P.M., Bachman, J.G., 1997. National survey results on drug use from the Monitoring the Future Study, 1975–1995, vol. 2: College Students and Young Adults. NIH Publication Number 98-4140. National Institute on Drug Abuse, Rockville, Maryland.

Kerlinger, F.N., 1986. Foundations of behavioral research, 3rd ed. CBS Publishing, Japan.

Korf, D.J., Wurth, B., 1995. New drugs in Europe—An overview of trends and monitoring systems in Europe. Pompidou Group, Council of Europe, Strasbourg.

Lenton, S., Boys, A., Norcoss, K., 1997. Raves, drugs and experience: Drug use by a sample of people who attend raves in Western Australia. Addict 92, 1327–1338.

Levine, I., 1994. Ravers get drugs tested on the spot. The Journal 23, 7.

Lilienfeld, A.M., Lilienfeld, D.E., 1980. Foundations of epidemiology, 2nd ed. Oxford University Press, New York.

Matthai, S.M., Sills, J.A., Davidson, D.C., Alexandrou, D., 1996. Cerebral oedema after ingestion of MDMA ('ecstasy') and unrestricted intake of water. Br. Med. J. 312, 13–59.

McDermott, P., 1993. MDMA use in the North West of England. Int. J. Drug Policy 4, 210–221.

McGuire, P.K., Cope, H., Fahy, T.A., 1994. Diversity of psychopathology associated with use of 3,4-methylenedioxymethamphetamine ('Ecstasy'). Br. J. Psychiat. 165, 391–395.

Merrill, J., 1996. Ecstasy and neurodegeneration. Br. Med. J. 313, 423.

Miller, M.A., 1997. History and epidemiology of amphetamine abuse in the United States. In: Klee, H. (Ed.), Amphetamine misuse: international perspectives on current trends. Harwood Academic, The Netherlands, pp. 113–134.

Moore, D., 1993. 'Speeding, ecking and tripping': Ethnographic notes from a small world of psychostimulant use. In: Burrows, D., Flaherty, B., MacAvoy, M. (Eds.), Illicit psychostimulant use in Australia. Australian Government Publishing Service, Canberra, pp. 71–90.

Newcombe, R., 1992 A researcher reports from the rave: An inside look at the risks of dance drugs and how to respond. Druglink, Jan/Feb, 14–16.

Nichols, D.E., Glennon, R.A., 1984. Medicinal chemistry and structure activity relationships of hallucinogens. In: Jacobs, B.L. (Ed.), Hallucinogens: neurochemical, behavioural and clinical perspectives. Raven Press, New York, pp. 95–142.

Norusis, M.J., 1993. SPSS for Windows™: Base System User's Guide, Release 6.0. SPSS, Inc., USA.

Ovendon, C., Loxley, W., 1996. Bingeing on psychostimulants in Australia: Do we know what it means (and does it matter)? Addict. Res. 4, 33–43.

Peroutka, S.J., 1990. Recreational use of MDMA. In: Peroutka, S.J. (Ed.), Ecstasy: the clinical, pharmacological and neurotoxicological effects of the drug MDMA. Kluwer Academic, Boston, pp. 53–62.

Peroutka, S.J., Newman, J.H., Harris, H., 1988. Recreational use of 3,4methylenedioxymethamphetamine (MDMA, ecstasy). Neuropsychopharmacology 1, 273–277.

Peters, A., Davies, T., Richardson, A., 1997. Increasing popularity of injection as the route of administration of amphetamine in Edinburgh. Drug Alcohol Depend. 48, 227–237.

Pompidou Group, 1997. Group of epidemiological experts in drug problems. Synthesis of the 1995 National Reports. Pompidou Group, Council of Europe, Strasbourg.

Release, 1997. Release drugs and dance survey: An insight into the culture. Release, London.

Schifano, F., Di Furia, L., Forza, G., Minicuci, N., Bricolo, R., 1998. MDMA ('ecstasy') consumption in the context of polydrug abuse: A report on 150 patients. Drug Alcohol Depend. 51, 85–90.

Series, H., Boeles, S., Dorkins, E., Peveler, R., 1994. Psychiatric complications of 'ecstasy' use. J. Psychopharmacol. 8, 60–61.

Siegel, S., Castellan, N.J., 1988. Nonparametric statistics for the behavioral sciences, 2nd ed. McGraw-Hill, Singapore.

Solowij, N., 1993. Ecstasy (3,4-methylenedioxymethamphetamine). Curr. Opin. Psychiat. 6, 411–415.

Solowij, N., Hall, W., Lee, N., 1992. Recreational MDMA use in Sydney: A profile of 'ecstasy' users and their experiences with the drug. Br. J. Addict. 87, 1161–1172.

van Laar, M.W., Spruit, I.P., 1997. Chasing 'ecstasy': use and abuse of amphetamine in the Netherlands. In: Klee, H. (Ed.), Amphetamine misuse: international perspectives and current trends. Harwood Academic, The Netherlands, pp. 247–272.

White, J., Bochner, F., Irvine, R., 1997. The agony of 'ecstasy': How can we avoid more 'ecstasy'-related deaths? Med. J. Aust. 166, 117–118.

Williamson, S., Gossop, M., Powis, B., Griffiths, P., Fountain, J., Strang, J., 1997. Adverse effects of stimulant drugs in a community sample of drug users. Drug Alcohol Depend. 44, 87–94.

Winstock, A.R., 1991. Chronic paranoid psychosis after misuse of MDMA. Br. Med. J. 302, 1150–1151.