EDRS

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Key findings

- There are indications for an increase in the prevalence in the use of mephedrone in recent years, particularly in the UK, Europe and Australia.
- One-fifth (21%) of the 2010 national REU sample reported lifetime use of mephedrone and 17% reported use of mephedrone in the six months preceding the interview.
- Mephedrone was typically swallowed or snorted on a median frequency of 3 days or approximately once every two months.
- Use of mephedrone was most common in particular jurisdictions such as Tasmania (47%) and Victoria (28%) followed by Western Australia (16%) and Queensland (13%).
- There were no differences between those who had or had not used mephedrone on a range of variables. However, regular ecstasy users who reported recent use of mephedrone were typically younger and were more likely to report recent use of hallucinogens, ketamine and amyl nitrate/nitrous oxide than those who had not used mephedrone. They were also more likely to report frequent and extended use of stimulants in the last six months. In terms of risk behaviours they were more likely to report recent unprotected sex with a casual partner and were more likely to report committing a crime in the last month.
- Given the recent increase in the use and availability of mephedrone in Australia, it is important that health workers in this area to be familiar with this drug and its effects and that users of the drug receive credible and timely harm reduction messages.
- The present research highlights the utility of the EDRS in identifying and monitoring emerging trends in illicit drug markets and its role as an early warning system.

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Mephedrone use among Regular Ecstasy Consumers in Australia

What is Mephedrone?

Mephedrone (4-methylmethcathinone) is a synthetic stimulant (common names: 4-MMC, Meow Meow, M-Cat, plant food) that is chemically similar to cathinone which is found in the *Catha edulis* or 'khat' plant. The 'khat' plant has a long history of human use, particularly in many east African communities such as in Yemen and Somalia. Mephedrone has grown in popularity worldwide over the past two years, particularly in the UK and Europe (see Brunt, Poortman, Niesink, & Van den Brink, 2010; Winstock, 2010).

Mephedrone is purported to have both stimulant and hallucinogenic/euphoriant properties and its effects have been likened to cocaine, MDMA, and amphetamines (Measham, Moore, Newcombe, & Welch, 2010; Winstock, 2010). Based on its chemical structure, it is likely that mephedrone has effects similar to amphetamines and therefore stimulates the release of monoamine neurotransmitters and then inhibits their reuptake (Winstock, 2010). There are also several less popular synthetic cathinones available such as methylone, and butylone (James et al., 2010; Winstock, 2010).

In an online survey of examining drug use among UK dance music and clubbing enthusiasts (n=2295), 41% reported lifetime use, 39% reported use in the last 12 months, and 33% reported use in the last month (Winstock et al., 2010). The frequency of use in the last month was 4 days (SD=5) or approximately weekly, with an average of 0.9g (SD=0.8) used in a typical session. In a UK survey of school and college/university students (n=1006), 20% reported lifetime use of mephedrone (Dargan, Albert, & Wood, 2010). There are currently no estimates of prevalence in Australia, although increased use of mephedrone was reported among Tasmanian ecstasy consumers in 2009 (Matthews & Bruno, 2010).

It has been suggested that that disillusionment with the purity and availability of other drugs such as cocaine and MDMA has been a driver for the increase in the popularity of mephedrone (Brunt et al., 2010; Measham et al., 2010; Winstock et al., 2010). It has also been reported by some users that mephedrone gives a better quality high than cocaine (Winstock et al., 2010).

Another driver of the increased use of mephedrone has been its legal status. In the recent past, mephedrone (and other synthetic cathinones) have not been controlled substances in many countries and have been freely available for purchase as 'research chemicals' or 'plant food' either online or in shops which sell 'legal highs' (James et al., 2010). However, given the recent increase in the use of mephedrone, many countries have recently classified the drug and its analogues as illegal. For example, mephedrone was classified as a controlled drug in the UK in April, 2010. In Australia it is a border controlled drug, due to its chemical similarity to methcathinone which is scheduled in the *Criminal Code Act, 1995*, but possession laws may differ in some Australian jurisdictions.

What are the effects and risks of mephedrone use?

Given its short history of human use, very little is known about the effects and risks of using the drug and there have been few animal or human toxicology studies or studies examining issues such as long-term problems, side effects, dependence, allergic reactions, acute overdose, and interactions with other drugs.

The acute psychological effects of mephedrone use may include euphoria, increased energy, excitement, hyperactivity, 'head rushes', feelings of empathy, increased libido, time distortions, paranoia and, in some cases, visual hallucinations (Measham et al., 2010; Winstock, 2010).

The acute physical effects of mephedrone may include dilated pupils, blurred vision, teeth grinding, sweating, dry mouth/thirst, hot flushes, fast/erratic heart beats, muscular tension in jaw and limbs, head ache, skin rashes, numbness/blue extremities, and nose bleeds/burns if snorted (Dargan et al., 2010; Measham et al., 2010; Winstock, 2010).

In a UK survey of school and college/university students, over one-half (56%) of recent users reported at least one unwanted side effect from mephedrone use. Winstock et al. (2010) reported a relationship between mephedrone dose and the experience of increased sex drive and excessive sweating. In addition, heart palpations were more common among those who had snorted the drug.

The main residual effect of mephedrone is insomnia and its after effects or 'comedown' effects have been described as similar to that of ecstasy and amphetamines and included fatigue, dizziness and low mood with some reporting amnesia following use (Measham et al., 2010). However, some online reports suggest that the mephedrone is associated with fewer after-effects relative to MDMA (see Winstock et al., 2010).

The possibility of mephedrone addiction or drug dependence has not been extensively studied, but there are come indications that the risk of dependence is higher than that of MDMA and cocaine. Several studies have reported that mephedrone induces strong feelings of cravings in most users (Brunt et al., 2010; Measham et al., 2010). In a UK survey of school and college/university students, 17% of recent users self reported symptoms associated with mephedrone addiction or dependence (Dargan et al., 2010). There is also some evidence that snorting mephedrone carries a greater risk of dependence than swallowing the drug (Winstock et al., 2010). For example, those who had snorted mephedrone were more likely to rate it as more addictive than cocaine. In addition there was a relationship between frequency of use and dose which is consistent with the development of tolerance.

Several mephedrone related deaths have been reported in the media, but exposure to mephedrone has been established analytically in only a few cases (see James et al., 2010), and in many cases it is not clear whether mephedrone was the primary cause of death (Dargan et al., 2010; Winstock, 2010). Recent reports suggest that there has been only two confirmed mephedrone related fatalities (one in the UK and one in Sweden) (Winstock et al., 2010).

Data from the UK National Poisons Information service (NPIS) suggests a recent increase in toxicity related to the recreational use of mephedrone (and other cathinones) in the UK (James et al., 2010). The most common clinical symptoms of presentations involving mephedrone included tachycardia, palpitations, agitation, anxiety, mydriasis, tremor, fever or sweating and hypertension (James et al., 2010). Other common symptoms included nausea, breathlessness, dizziness, and headache. Infrequent symptoms included skin rashes and local effects in the mouth, pharynx or nose. Some patients also reported numbness or pain in extremities suggestive of peripheral vasoconstriction. Mephedrone was most typically reported to have been taken alone or in combination with alcohol. Confusion and/or psychosis were also often a feature of presentations.

Wood, Greene and Dargan (2010) describe 15 patients who presented to a UK Emergency Department following self-reported mephedrone use. Significant clinical features included agitation, tachycardia, hypertension and seizures suggestive of excessive sympathomimetic stimulation. However, in contrast to previous reports mephedrone toxicity was not associated with pain or numbness in extremities. All patients had used alcohol and all were discharged with no residual effects.

Aims and methodology

The aim of the present research is to describe the recent use of mephedrone among Australian ecstasy users who participated in the Ecstasy and Related Drug Reporting System (EDRS), including jurisdictional differences. A further aim is to examine demographic and drug use characteristics among those who have recently used mephedrone compared to those who have not.

The Ecstasy and Related Drugs Reporting System (EDRS), formerly known as the Party Drugs Initiative (PDI), is an annual study designed to monitor ecstasy and related drug markets in every capital city jurisdiction of Australia. The project includes a survey of regular ecstasy users (REU), interviews with key experts who have regular contact with REU, and analysis of existing indicator data in relation to ecstasy and other drug use.

A total of 693 regular ecstasy users were interviewed for the 2010 EDRS: 101 from Queensland; 100 each from New South Wales, Victoria, Tasmania, and Western Australia; 92 from South Australia, 73 from the Australian Capital Territory; and 27 from the Northern Territory. Eligibility criteria included at least monthly use of ecstasy in the preceding six months, at least 16 years of age, and residence on the relevant capital city of each jurisdiction for at least 12 months.

REU were 24 years old (range 16 to 59) on average, and three fifths (58%) were male. The majority of participants were heterosexual (86%) and spoke English as their main language (98%). A minority identified as being of Aboriginal or Torres Strait Islander descent (2%). Participants were typically well educated with a majority (80%) having completed a Year 12 education, and most were currently employed (54%) or studying (30%). Few participants reported a previous prison conviction (1%) or were currently in drug treatment (4%). Detailed findings of the 2010 EDRS will be available on the NDARC website in 2011 and past national and state reports are currently available online at the following address: http://ndarc.med.unsw.edu.au/NDARCWeb.nsf/page/EDRS

Use of mephedrone among Australian regular ecstasy consumers

Table 1 shows that one-fifth (21%) of the 2010 national REU sample reported lifetime use of mephedrone and 17% reported use of mephedrone in the six months preceding the interview. Mephedrone was typically swallowed (67%) or snorted (64%) on a median frequency of 3 days in the last six months or approximately once every two months.

These findings are consistent with research in the UK suggesting that mephedrone is most commonly used in powder or capsule form and is typically snorted or swallowed (Dargan et al., 2010; Measham et al., 2010; Winstock et al., 2010). In a recent UK survey, those who reported snorting the drug also reported higher frequency and quantity of use compared to those who had swallowed the drug (Winstock et al., 2010).

The median price for one gram of mephedrone was reported to be $150 and the median price for one capsule was $30 (Table 1). Research with users in the UK (*n*=10) indicates that mephedrone was either purchased online (£10 per gram) or at nightclubs (£15 per gram) Newcombe, 2010, cited in Measham et al., 2010). Among these UK users, the average dosage over an evening was 0.5-1 grams, taken every hour or so in doses of 100-200mg.

A large majority of the sample reported sourcing mephedrone through a dealer (72%) and a smaller proportion reported sourcing the drug from the internet (10%). These findings are similar to research conducted in the UK in which students reported that most common source of mephedrone was through a dealer (49%), while internet purchases were less common (11%) (Dargan et al., 2010).

It has been argued that the uptake of mephedrone in the UK and Europe may be related to the decreased availability and purity of other drugs such as MDMA and cocaine. Consistent with this proposal, a reduction in the perceived availability and purity of ecstasy was noted among the present Australian REU cohort. For example, a significantly greater proportion of participants reported that ecstasy was 'difficult' or 'very difficult' to obtain in 2010 (26%) relative to 2009 (12%). In addition, a significantly greater proportion of participants reported that ecstasy was 'low' in purity in 2010 (56%) relative to 2009 (24%).

Table 1. Use, route of administration, price and source of mephedrone among regular ecstasy users.

	EDRS sample n=693
Mephedrone use	
% ever used mephedrone	21
% used mephedrone in last 6 mths	17
Median days of use (range)*	3 (1-100)
Route of administration*	
% swallowed	67
% snorted	64
% smoked	4
% injected	1
Price	
Median price per gram (range)	$150 (16-320)
Median price per cap (range)	$30 (1-41)
Source	
% dealer	72%
% internet	10%

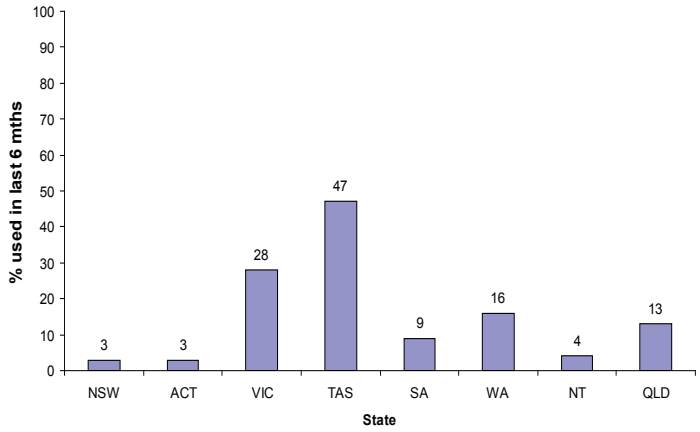
Source: EDRS interviews 2010
*** among those who had used mephedrone in the last 6 months**

Jurisdictional differences in recent mephedrone use

Figure 1 shows the proportion of each jurisdictional sample who reported recent use of mephedrone in the six months preceding the interview. The highest proportions of use occurred among the Tasmanian (47%) and Victorian (28%) samples followed by Western Australia (16%) and Queensland (13%). Use was less than 10% for other jurisdictions. Table 2 shows the median frequency of use in the last six months in each Australian jurisdiction. The median frequency of use ranged from 1 to 10 days, with the highest frequency of use seen among jurisdictions in which few participants reported recent use (NT, ACT, SA) and in Tasmania where an average of monthly use was reported.

The high levels of recent use and frequency of in Tasmania is consistent with a trend of increasing use in previous years, with 1% reporting recent use in 2008 and 14% reporting recent use on 2009 (Matthews & Bruno, 2010). In 2008/09, increased use of capsules sold as 'Israelis' was noted in Hobart and these were subsequently confirmed to contain mephedrone by Tasmania Police. In 2010 use of 'Israelis' was less commonly reported in Hobart, but there was a substantial increase in the use of capsules marketed as 'mephedrone'.

Figure 1. Proportion of sample reporting use of mephedrone in the last six months in each Australian jurisdiction.



Source: EDRS interviews 2010

Table 2. Median days of use in the last six months among REU in each Australian jurisdiction.

	NSW	ACT	Vic	Tas	SA	WA	NT	Qld
Median Days	2	8	2	6	7	1	10	2
Range	1-4	1-15	1-24	1-36	1-20	1-100	10	1-15
n reporting	3	2	28	47	8	16	1	13

Source: EDRS interviews 2010

Correlates of recent mephedrone use

A series of logistic regression analyses were conducted to examine a range of demographic, drug use, harm and risk behaviour variables to see if they were associated with the recent use of mephedrone. In terms of demographic characteristics, those who were 21 years of age or less were more likely to report recent use of mephedrone relative to those older than 21 years of age (Table 3). There were no significant differences between the groups in terms of recent high frequency or high quantity ecstasy use (Table 3). Those who had used mephedrone were significantly more likely to report recent use of psychedelics (LSD and/or mushrooms), ketamine, and amyl nitrite/nitrous oxide in the last six months (Table 3). However, there were no significant differences between the two groups in terms of recent use of alcohol, cannabis, tobacco, methamphetamine, cocaine or GHB.

Table 3. Demographic characteristics and patterns of ecstasy and other drug use among those who had or had not used mephedrone in the last 6 months.

	No Mephedrone (n=575) %	Mephedrone (n=118) %	OR	(95%CI)
Demographic characteristics				
Female	43	36	0.77	0.51-1.16
Age (% ≤21)	38	56	2.04***	1.36-3.05
Sexual preference (% GLBT)	14	16	1.13	0.65-1.98
Did not complete year 12 (and not currently studying)	18	15	0.82	0.47-1.40
Unemployed	15	13	0.84	0.47-1.51
Currently in drug treatment	4	3	0.92	0.31-2.74
Ecstasy use in last 6 months				
Used ecstasy weekly or more often	21	21	1.01	0.62-1.64
Usually consume more than 2 tablets when take ecstasy	35	32	0.89	0.58-1.36
Other drug use in last 6 months				
Used alcohol	97	99	3.79	0.5-28.65
Used alcohol daily	9	6	0.61	0.27-1.37
Used cannabis	80	83	1.26	0.75-2.13
Used cannabis daily	15	12	0.79	0.43-1.45
Used tobacco	77	85	1.70~	0.99-2.92
Used tobacco daily	38	44	1.31	0.88-1.96
Used methamphet	55	59	1.22	0.82-1.82
Used cocaine	47	55	1.41	0.94-2.09
Used psychedelics (LSD/mushrooms)	39	62	2.52***	1.68-3.79
Used ketamine	10	20	2.11**	1.24-3.59
Used GHB	5	9	1.67	0.80-3.53
Used amyl nitrite or nitrous oxide	36	58	2.40***	1.60-3.59

Source: EDRS interviews 2010
Note: *** p<.001, ** p<.01, * p<.05, ~ p<.10

Table 4 shows differences in the proportion of those who had or had not used mephedrone as a function of drug-related and health related harms, risk behaviours and crime. There was no significant difference between the groups in terms of drug-related and health-related harms including high psychological distress, substance abuse, alcohol problems, self-reported mental health problems, overdose, and use of health services for problems relating to drug use.

In terms of recent risk behaviours in the last six months, those who had used mephedrone were significantly more likely to report recent use of any 'party' drug weekly or more often, recent 'binge' use of stimulants (under influence for ≥ 48 hours without sleep), recent crime in the last month and recent unprotected sex with a casual partner. There were no differences in recent binge drinking with ecstasy, intravenous drug use, driving under the influence of drugs, or recent arrests.

Table 4. Drug-related and health-related harms, risk behaviours, and crime among those who had or had not used mephedrone in the last 6 months.

	No Mephedrone (n=575) %	Mephedrone (n=118) %	OR	(95%CI)
Drug-related and health-related harms				
Screen positive for 'high' or 'very high' psychological distress (K10 ≥ 22 past mth)	27	21	0.74	0.46-1.20
Self-reported mental health problem	28	31	1.16	0.75-1.78
Any 'overdose' in past six months	20	25	1.29	0.81-2.06
Screen positive for possible DSM 'substance abuse' (repeated drug-related problems)	56	61	1.24	0.83-1.86
Screen positive for 'high level of alcohol problems' (AUDIT ≥ 16)	46	45	0.99	0.66-1.47
Accessed health services (e.g., first aid, ambulance, hospital, GP) due to drug use	18	14	0.79	0.45-1.38
Accessed talk therapy (e.g., counsellor, psychologist, psychiatrist) due to drug use	14	14	0.94	0.53-1.68
Risk behaviours				
Use any 'party drug' weekly or more often	31	42	1.63*	1.09-2.45
Recent 'binge' use of stimulants (under influence for ≥ 48 hours without sleep)	32	44	1.67*	1.12-2.51
Binge drink (consume ≥5 standard drinks) last time taking ecstasy	70	65	0.76	0.50-1.15
Injected any drug in last 6 months	10	6	0.55	0.25-1.24
Had unprotected penetrative sex with casual partner last 6 months	37	53	1.88**	1.26-2.80
Driven under the influence of drugs in last 6 months	41	50	1.44	0.97-2.15
Arrested in the past 12 months	13	17	1.32	0.77-2.26
Any crime (property, drug dealing, violent, fraud) in past month	31	41	1.50*	1.00-2.26

Source: EDRS interviews 2010
Note: *** p<.001, ** p<.01, * p<.05, ~ p<.10

Conclusions & Implications

The present findings suggest that the use of mephedrone has increased among regular ecstasy consumers in Australian capital cities in 2010 relative to previous years. Consistent with previous research, mephedrone had typically been snorted or swallowed in capsule or powder form on a median frequency of 3 days or approximately once every two months. Use of mephedrone was most common in particular jurisdictions such as Tasmania (47%) and Victoria (28%) followed by Western Australia (16%) and Queensland (13%). The median frequency of use was also high in Tasmania at six days in the last six months or approximately monthly.

No previous research has examined health-related harms and risk taking behaviours among mephedrone users. In the present study there was no difference between regular ecstasy users who had or had not used mephedrone on a range of variables. However, compared to other regular ecstasy users in this study those who had recently used mephedrone were typically younger and more likely to report recent use of psychedelics (LSD and/or mushrooms), ketamine, and amyl nitrite/nitrous oxide. They were also more likely to have engaged in some risky drug use behaviours such as recent use of any 'party' drug weekly or more often and recent binge use of stimulants (under influence for ≥ 48 hours without sleep). It has previously been suggested that mephedrone may increase sexual risk taking due to its dose-dependent effects on libido (Winstock, 2010; Winstock et al., 2010). The present results are consistent with this proposal, as recent mephedrone users were significantly more likely to report unprotected sex with a casual partner. Recent use of mephedrone was also associated with increased likelihood of committing a crime in the past month.

Given the recent increase in the use and availability of mephedrone in Australia, it is important for health workers in this area to be familiar with this drug and its effects. It is also important that users of the drug receive credible and timely harm reduction messages. In a recent review it was suggested that people with underlying cardiac, neurological, and psychiatric conditions, especially those on medication, are likely to be at greatest risk of serious adverse events (Winstock, 2010). In addition use of mephedrone in combination with other stimulant drugs or alcohol may also contribute to an increased risk of adverse effects. Other harm reduction messages include advice to avoid regular use to reduce the risk of dependence and avoiding dehydration and overheating and intravenous use (Winstock, 2010). In addition, intra-nasal use may result in greater physical harms and risk of dependence (Winstock et al., 2010) and the present research suggests an increased incidence of unsafe sex among users of the drug.

The present research highlights the utility of the EDRS in identifying and monitoring emerging trends in illicit drug markets and its role as an early warning system. The fact that there are few discernable differences between REU that do and do not use mephedrone suggests a wide appeal for the drug, and the potential for mephedrone to rapidly spread in Australia as it has in the UK. Given recent legislative changes in Australia and in the UK and Europe, continued monitoring of trends in drug markets will be important in the coming years. Mephedrone prohibition may result in the continued transition of mephedrone into the illicit street market or a shift towards other psychoactive substances which are currently unsanctioned (Winstock, 2010; Winstock et al., 2010). In addition, following a ban on mephedrone in the UK, it was found that mephedrone and its analogues were still available to purchase online under new names (Brandt, Sumnall, Measham, & Cole, 2010). This suggests consumers may also be unknowingly at risk of criminalisation and potential harm through buying second generation mephedrone products.

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