Monograph No. 37

ILLICIT DRUGS: CURRENT ISSUES AND RESPONSES

Proceedings from the Eleventh National Drug and Alcohol Research Centre Annual Symposium

held at the Masonic Centre, Sydney, November, 1997

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ISBN 0 947 229 914

PREFACE

Paul Dillon
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The National Drug and Alcohol Research Centre (NDARC) was established as a Centre of Excellence at the University of New South Wales in May 1986, and was officially opened in November 1987. It is funded by the Commonwealth Government as part of the National Drug Strategy (NDS).

The National Centre has grown into a world renowned, multi-disciplinary and productive research centre, with the brief of contributing towards an increase in the effectiveness of interventions for alcohol and other drugs problems in Australia. The term 'illicit drug' refers to substances that are illegal to possess or use, or that are prohibited or controlled but used for non-medical purposes. Almost all illicit drugs are examined in a variety of NDARC projects, from the more 'traditional' drugs such as heroin and cannabis, to the 'designer drugs' of recent years such as ecstasy. The use of pharmaceutical products such as ketamine, which is used illicitly by some sections of the drug-using community is also currently being studied at the Centre.

In 1997 illicit drugs, particularly heroin and cannabis, received a great deal of media coverage. Fatal heroin overdoses had increased seven-fold between 1979 to 1995 and once again the issues surrounding the decriminalisation of cannabis were raised in the public arena. Illicits such as ecstasy and other 'party drugs' were also making headlines due to an apparent increase in use, particularly by young people. The illicit use of pharmaceutical products such as anabolic steroids and benzodiazepines was creating concern among alcohol and other drug workers, as well as the general community. In view of this increased community interest, the Eleventh Annual Symposium chose to showcase the important research being conducted by NDARC staff examining illicit drugs.

The Symposium, ***Illicit Drugs: Current Issues and Responses***, was held at the Masonic Centre in Sydney, and was attended by over 100 clinicians, academics and drug and alcohol workers from around the country. Opened by the Executive Director, Professor Wayne Hall, the day covered three sessions and concluded with a panel discussion examining treatment approaches to cannabis. This monograph contains a selection of the papers presented on the day and provide a broad representation of NDARC's current illicit drug research. Given the often sensationalist media coverage of illicit drug issues, the NDARC Symposium plays an important role in conveying our research findings to the research and clinical communities. We hope that dissemination of this research contributes to a rational

and objective perspective of the ongoing debate surrounding the use and status of these drugs.

It is vital that NDARC maintain its brief of being at the forefront of current events in the area of illicit drug use in Australia. The development of the Illicit Drug Reporting System (IDRS) as an early warning system for the Commonwealth Government will contribute greatly to ensuring that authorities have a thorough understanding of the current drug market. The trial project was conducted in Sydney in 1996. Phase II was conducted in NSW (Sydney), South Australia (Adelaide) and Victoria (Melbourne), and provided information on a wide range of areas associated with the use of four drugs: heroin, cocaine, amphetamines and cannabis, with the aim of identifying emerging drug trends. This has paved the way for a national IDRS to be established in 1998, which will not only provide an excellent 'snapshot' of current happenings, but will also assist us in developing future research projects based on the findings.

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BENZODIAZEPINE DEPENDENCE AND PSYCHOPATHOLOGY AMONG HEROIN USERS

Joanne Ross & Shane Darke

INTRODUCTION

When benzodiazepines were first introduced in the early 1960's they were thought to be "non-habit forming" (Lennane, 1986). By the end of the 1960's, it was even being suggested that non-medical personnel such as social workers should be permitted to prescribe benzodiazepines, as there were so few risks thought to be associated with them (Owen & Tyrer, 1983). While it is true that benzodiazepines, because of a lower risk of toxicity, represent a safer alternative to barbiturates, it is now firmly established that there is a withdrawal syndrome associated with their use (Mant et al, 1993).

Benzodiazepine use is widespread among heroin users (Navaratnam & Foong, 1990; Darke, 1994; Lennane, 1986; Ross, Darke & Hall, 1997), and previous studies suggest that approximately a quarter of those heroin users who use benzodiazepines exhibit some degree of benzodiazepine dependence, as determined by the Severity of Dependence Scale (SDS) (Ross, Darke & Hall, 1996; 1997). This is of particular concern given that benzodiazepine use is considered to play a significant role in heroin overdose fatalities, with benzodiazepines typically being detected in a quarter of overdose deaths (Zador, Sunjic & Darke, 1996; Darke, Zador & Sunjic, 1997). It should be acknowledged, however, that the SDS has yet to be validated for use in assessing benzodiazepine dependence. The studies that used the SDS as a measure of benzodiazepine dependence adopted the cut-off mark that has been found to be indicative of dependence when assessing heroin, cocaine and amphetamine dependence (Gossop et al., 1995; Topp & Mattick, 1997). It is possible that a different cut-off mark would be more appropriate when assessing benzodiazepine dependence. More importantly, no study to date has reported what proportion of heroin users meet the criteria for a clinical diagnosis of benzodiazepine dependence, as assessed by the American Psychiatric Association's Diagnostic and Statistical Manual (DSM).

A strong association between opioid use and psychopathology has been consistently identified in the literature (Limbeek, Wouters, Kaplan, Geerlings & Alem, 1992; Darke, Wodak, Hall, Heather, & Ward 1992; Rounsaville & Kleber, 1986), with higher rates of anxiety and depression being noted among those opioid users who

use benzodiazepines (Darke et al., 1994; Ross et al., 1997). Heroin users who use benzodiazepines have been found to have higher levels of depression, anxiety and global psychopathology than other heroin users (Darke et al., 1994). Anxiety and depression have also been associated with route of benzodiazepine administration among heroin users (Ross et al., 1997), with injectors of benzodiazepines exhibiting higher levels of psychological distress, as measured by the General Health Questionnaire (GHQ), than oral users. In turn, oral users exhibited greater psychological distress than non-users of benzodiazepines.

The exact nature of the relationship between benzodiazepine use and psychological disorders such as anxiety and depression remains unclear. It may be that heroin users who use benzodiazepines are self-medicating pre-existing anxiety and/or depression. Alternatively, it is possible that the increased psychological distress is a consequence of their benzodiazepine use. A third possibility is that these heroin users are using benzodiazepines to self-medicate pre-existing psychopathology, but through an erratic cycle of benzodiazepine use and withdrawal, the anxiety and/or depression becomes exacerbated. In terms of treatment, it would be useful to know which, if any, of these hypotheses is correct.

Benzodiazepine use among heroin users presents a serious treatment and public health concern. The current study aimed to determine to what extent heroin users meet the criteria for benzodiazepine dependence. If heroin injectors use benzodiazepines at levels sufficient to develop benzodiazepine dependence, they are likely to frequently be at greater risk of death from heroin overdose. The study also attempted to address the aetiological problem with regard to the onset of regular benzodiazepine use and the onset of anxiety and/or depression. A better understanding of the relationship between benzodiazepine use and psychopathology among heroin users may prove useful to health workers dealing with these clients in the treatment setting.

Study Aims

The major aims of the current study were as follows:

1. To assess the extent to which heroin users meet the criteria for a DSM-III-R diagnosis of benzodiazepine dependence;

2. To determine an appropriate cut-off mark on the Severity of Dependence Scale for benzodiazepine dependence;

3. To determine the lifetime prevalence of DSM-III-R diagnoses of anxiety and depression among heroin users;

4. To establish the extent to which the onset of anxiety and/or depressive disorders precede the onset of regular benzodiazepine use.

METHOD

Subjects

All subjects were volunteers who were paid A$30 for their participation in the study. Recruitment took place from April 1996 to February 1997, by means of advertisements placed in rock magazines, needle exchanges, methadone maintenance clinics and by word of mouth. Heroin users were recruited from all regions of Sydney.

Subjects contacted the researchers, and were screened for eligibility to be interviewed for the study. To be eligible for the study subjects had to either be in treatment for heroin dependence, or have used heroin during the preceding 3 months or both. Each interview was conducted in a location determined by the subject. Interview sites ranged from methadone clinics and needle exchanges, to pubs, parks, coffee shops and shopping centres. All interviews were conducted by one of the research team (JR) and took between 60 and 90 minutes to complete.

Structured interview

A structured interview was devised that addressed the following areas: demographic characteristics, drug use history, heroin dependence, benzodiazepine dependence, benzodiazepine use history, and lifetime prevalence of anxiety and depressive disorders. The questionnaire incorporated the SDS (Gossop, Griffiths, Powis & Strang, 1992; Gossop et al., 1995), the GHQ (Banks, 1983) and several sections of the Composite International Diagnostic Interview (CIDI) version 1.1 (World Health Organisation, 1993). This version of the CIDI operationalises DSM-III-R criteria to provide diagnoses. The CIDI sections included were:

- the Alcohol abuse & dependence section;
- the Drug abuse and dependence section;
- and the sections covering: major depressive episodes and dysthymia, panic disorder, generalised anxiety disorder and phobic disorders.

Analyses

For continuous variables t-tests or pearson product correlations were employed. Categorical variables were analysed using chi^2, and corresponding odds ratios (O.R.) and 95% confidence intervals (C.I.) were calculated. Where distributions were highly skewed, medians were reported. Highly skewed continuous data were analysed using the Mann-Whitney U statistic. A receiver operating characteristic (ROC) analysis was conducted in order to determine the the most appropriate cut-off mark on the SDS for benzodiazepine dependence. Predictors of benzodiazepine dependence were determined using multiple logistic regressions with backwards elimination. All analyses were conducted using SYSTAT (Wilkinson, 1990).

RESULTS

Sample characteristics

The sample consisted of 222 subjects, of whom 59% were male. The mean age of the sample was 29.8 years (SD 7.2, range 17-50). The mean number of years of school education was 9.9 (SD 2.5, range 5-12), the majority of the sample (72%) had no tertiary qualifications, and most were unemployed (77%). A large proportion reported having a prison record (44%), with males being more likely than females to report ever having been imprisoned (55% v 29%, O.R.=2.9, 95% C.I. 1.64-5.10).

Approximately half of the sample (51%) were currently enrolled in methadone maintenance programs and one subject was a member of a therapeutic community.

Benzodiazepine use

The majority of subjects (91%) had used benzodiazepines, and 67%were current users (having used these drugs during the preceding 12 months). The mean age of first benzodiazepine use was 19.4 years (SD 6.1, range 6-40), and 21.1 years (SD 6.2, range 10-40) for the commencement of regular use. The mean length of time at interview since initial benzodiazepine use was 9.7 years (SD 7.2, range <1-28). While 43% of current benzodiazepine users had used benzodiazepines prior to trying heroin, 39% had used heroin first.

While the median number of days on which benzodiazepines had been used in the six months prior to interview was 11 (range 0-180), 37% had used them once a week or more, including 10% who had used them daily. Fourteen percent of current benzodiazepine users had injected benzodiazepines at some stage during the six months preceding interview.

Subjects were asked to think back to the 12 month period when they were using benzodiazepines most frequently, and to recall how often they were using benzodiazepines during that period. Forty percent of current benzodiazepine users reported having had a 12 month period during which they used benzodiazepines almost every day. The mean age at commencement of their most regular benzodiazepine use was 22.2 years (SD 6.9, range 11-47), and the mean age when they last used benzodiazepines that regularly was 27.4 (SD 7.7, range 13-47). Benzodiazepine use by injection had been tried at some stage by 42% of current benzodiazepine users.

Other drug use

Polydrug use was common among the sample. Heroin, by definition, had been used by all subjects, with 87% having used it in the last 6 months. Similarly, the majority of the sample (82%) had used other non-prescribed opiates, with 40% having done so in the six months preceding interview. Twenty seven percent of subjects reported having injected opiates other than heroin in that time.

The mean SDS score for heroin was 7.0 (SD 4.4, range 0-15). Using a cut-off mark of greater than 4, 70% of subjects were classified as currently heroin dependent. The vast majority of subjects reported having ever used alcohol (100%), cannabis (99%), tobacco (98%), amphetamines (97%)and hallucinogens (88%), with cocaine (76%) and inhalants (69%) having also been widely used. In the six months prior to interview the most commonly used drugs were tobacco (95%), cannabis (83%), alcohol (73%) and amphetamines (51%).

Including benzodiazepines, the mean number of drug classes ever used was 9.0 (SD 1.2, range 4-10), with a mean of 5.3 (SD 1.9, range 0-10) having been used in the last six months. The mean number of drug classes ever injected was 3.8 (SD 1.3, range 1-6), and 1.8 (SD 1.1, range 0-6) in the six months prior to interview.

Benzodiazepine dependence

According to the CIDI, 22% of current users were benzodiazepine dependent, 3% mildly so, 7% moderately and 12% severely dependent. Among current benzodiazepine users, the median SDS score for benzodiazepines was 0 (range 0-15). Previous studies have shown that the appropriate cut-off mark for identifying dependence on heroin, cocaine, or amphetamines using the SDS is 4/5 (Gossop et al., 1995; Topp et al., 1997). Using this cut-off mark, 18% of current benzodiazepine users exhibited some degree of benzodiazepine dependence.

In order to determine whether a cut-off mark of 4/5 is an appropriate one to use for assessing benzodiazepine dependence among heroin users, an ROC analysis was conducted, using the CIDI as the gold standard. This suggested that a score of greater than 2 may be a more appropriate cut-off mark. Using this cut-off, 25% of current benzodiazepine users were diagnosed as dependent.

To receive a lifetime DSM-III-R diagnosis of benzodiazepine dependence, participants had to report meeting at least 3 of the 9 dependence criteria. For the diagnosis to be current, at least one of these symptoms had to be experienced in the last 12 months. Table 1 shows the prevalence of symptoms in the 12 months preceding interview. Unfortunately, the CIDI version 1.1 does not obtain recency data on the first symptom, "continued use despite social, physical or psychological problems", therefore, the figure for that symptom represents lifetime prevalence. Keeping this in mind, the most commonly endorsed dependence criteria were continued use despite social, physical or psychological problems (31%), tolerance (24%) and frequent intoxication and/or withdrawal when expected to fulfil obligations (22%).

The mean number of dependence criteria met within the past 12 months by these participants was 5 and the range was 1-8. This represents 5 out of 8 criteria, as we don't have recency information for the first symptom.

Table 1: Prevalence of DSM-III-R criteria for benzodiazepine dependence among current users (N=148)

Criteria	Current benzodiazepine users %
Continued use despite social, physical or psychological problems*	(31)
Tolerance	24
Frequent intoxication/withdrawal when expected to fulfil obligations	22
Taken in larger quantities/for longer than intended	16
Withdrawal	15
Persistent desire/unsuccessful efforts to cut down	14
Withdrawal relief	13
A great deal of time spent acquiring/using/recovering	12
Neglecting important activities	10

* *Recency data for the past 12 months is not available on this symptom. Figure in brackets refers to the lifetime prevalence.*

In order to determine which factors were independently associated with a lifetime DSM-III-R diagnosis of benzodiazepine dependence, a multiple logistic regression was conducted. The variables entered into the model were age, sex, years of school education, treatment status, routes of benzodiazepine administration ever used, frequency of most regular benzodiazepine use, age at initiation of injecting drug use, number of drug dependencies ever (excluding benzodiazepines), number of anxiety disorders ever and number of depressive disorders ever. The only significant predictors were frequency of most regular benzodiazepine use and the number of lifetime drug dependencies (Table 2). The regression equation was significant (χ^2, 2 df=94.4, $p<.001$), and had a good fit (Hosmer-Lemeshow $\chi^2=5.3$, $p<.70$).

Table 2: Multiple logistic regression predicting a lifetime CIDI diagnosis of benzodiazepine dependence (N=202)

Variable	O.R.	95% C.I.
Frequency of most regular benzodiazepine use	3.68	2.21-6.13
Number of drug dependencies ever	2.56	1.67-3.92

Hosmer-Lemeshow $\chi^2=5.3$, $p<.70$

The results indicate that, after controlling for the effects of other variables in the

model, each categorical increase in the frequency of most regular benzodiazepine use, increases the odds of having been benzodiazepine dependent by more than three and a half times. Furthermore, each additional drug dependency ever experienced increases the likelihood of having been benzodiazepine dependent by two and a half times.

Prevalence of anxiety and depressive disorders

Those subjects who were diagnosed by the CIDI as having ever been benzodiazepine dependent were significantly more likely than the remainder of the sample to have ever had either an anxiety (75% v 55%, O.R. 2.43, 95% C.I. 1.21-4.87) or depressive disorder (65% v 33%, O.R 3.85, 95% C.I. 2.00-7.40) (Table 3).

More specifically, subjects with a lifetime diagnosis of benzodiazepine dependence were more likely to have had panic attacks with agoraphobia (27% v 8%, O.R. 4.11, 95% C.I. 1.81-9.33), simple phobias (52% v 28%, O.R. 2.75, 95% C.I. 1.45-5.20), dysthymia (35% v 15%, O.R. 2.93, 95% C.I. 1.44-5.95) and major depression (54% v 27%, O.R. 3.14, 95% C.I. 1.66-5.97). With regard to social phobias, the difference between the two groups approached but did not attain significance (50% v 36%, O.R. 1.79, 95% C.I. 0.95-3.35).

Table 3: Lifetime prevalence of anxiety and depressive disorders among subjects with and without a lifetime diagnosis of benzodiazepine dependence

Diagnosis	Lifetime benzodiazepine dependence (n=52) %	No benzodiazepine dependence (n=170) %	Total (n=222) %
Anxiety Disorders			
Social phobia	50	36	39
Simple phobia*	52	28	33
Agoraphobia	23	21	21
Panic attacks with agoraphobia*	27	8	12
Panic attacks	12	5	7
GAD	10	3	5
Depressive Disorders			
Dysthymia*	35	15	20
Major depression*	54	27	33
Any anxiety disorder*	75	55	60
Any depressive disorder*	65	33	41

* *Statistically significant difference exists between groups*

Order of onset of anxiety, depressive disorders and regular benzodiazepine use

Two thirds (66%) of regular benzodiazepine users had ever had an anxiety disorder, and a half (49%) had ever had a depressive disorder. Of those subjects identified as having had an anxiety disorder, 81% reported having had the disorder prior to the onset of regular benzodiazepine use (Table 4). This was particularly the case with regard to simple phobias (84%), social phobias (73%) and panic attacks with agoraphobia (71%).

Similarly, 61% of regular benzodiazepine users identified as having had a depressive disorder, reported having had such a disorder prior to the onset of regular benzodiazepine use. This was particularly true with regard to dysthymia (76%).

Table 4: Proportions of regular benzodiazepine users with anxiety or depressive disorders in which the diagnosis preceded the onset of regular benzodiazepine use

Diagnosis	Percent
Anxiety	
Simple phobia (n=57)	84
Social phobia (n=64)	73
Panic attacks with agoraphobia (n=24)	71
Panic attacks (n=12)	50
Agoraphobia (n=31)	32
Generalised Anxiety Disorder (n=8)	25
Any anxiety disorder (n=96)	81
Depression	
Dysthymia (n=33)	76
Major depression (n=60)	53
Any depressive disorder (n=71)	61

Prevalence of other substance dependence diagnoses

Excluding benzodiazepines, subjects with a lifetime diagnosis of benzodiazepine dependence had been dependent on a greater number of drugs in their lifetime than those subjects without a history of benzodiazepine dependence (3.8 v 2.5, t_{220}=-7.23, p<.001).

Subjects with a lifetime diagnosis of benzodiazepine dependence were significantly more likely than the remainder of the sample to have a lifetime diagnosis of alcohol dependence (83% v 60%, O.R. 3.19, 95% C.I. 1.46-6.96) and cocaine dependence

(23% v 4%, O.R. 6.99, 95% C.I. 2.58-18.88).

DISCUSSION

The major finding of the current study was that more than one in five of those heroin users who had used benzodiazepines in the 12 months prior to interview met the criteria for a current diagnosis of benzodiazepine dependence. This is of particular cause for concern given that benzodiazepines were not the primary drug of choice among this group. With an average of 5 dependence symptoms experienced in the preceding twelve months, it is clear that benzodiazepine dependence would be impacting significantly on the lives of these heroin users.

The only significant predictors of a lifetime diagnosis of benzodiazepine dependence were frequency of most regular benzodiazepine use and the number of drug dependencies ever experienced. Doctors and heroin users should be mindful of the fact that benzodiazepine dependence can occur after as little as 6 weeks of benzodiazepine use at therapeutic levels (Mant et al., 1987). As heroin users would very rarely nominate benzodiazepines as their preferred drug, and typically only use them as adjunct to heroin (Ross et al, 1996), it is highly unlikely that many of them would have considered whether or not they were at risk of becoming dependent on benzodiazepines. It is important that doctors take the time to ensure that their patients are fully informed of the risk of benzodiazepine dependence and the associated withdrawal syndrome.

The current study suggests that the SDS represents an efficient way of assessing current benzodiazepine dependence among heroin users. While a cut-off mark of greater than four has been recommended for assessing heroin, cocaine or amphetamine dependence, a cut-off mark of greater than two appears more appropriate in assessing benzodiazepine dependence among heroin users. The lower cut-off point may, in part, be a reflection of the fact that benzodiazepines are not the primary drug of choice among this population. It is likely that the problems experienced as a consequence of benzodiazepine use are overshadowed by the problems associated with heroin use.

Those heroin users who had a lifetime diagnosis of benzodiazepine dependence were significantly more likely than the rest of the sample to have had either an anxiety or depressive disorder. Among those subjects who were or had been regular benzodiazepine users, the onset of anxiety or depressive disorders appeared to precede the onset of regular benzodiazepine use in the majority of cases. This suggests that, to some extent, these subjects may be self-medicating pre-existing psychopathology.

Given that benzodiazepines are prescribed for anxiety, it may not be considered surprising that subjects with a history of benzodiazepine dependence are more likely to have had an anxiety disorder. However, as benzodiazepines are commonly used among heroin users to manage symptoms of heroin withdrawal or to enhance the effects of heroin, it should not be assumed that the anxiety disorder is a precursor

rather than a consequence of benzodiazepine use. Such high rates of anxiety and depression have implications for the treatment of drug use. Not only do treatment services need to be capable of managing clients who have multiple drug dependencies, they also need to cope with co-existing anxiety and depressive disorders.

Polydrug use was widespread among the sample, with a mean of nine drug classes having ever been used, and a mean of five used in the preceding six months. Excluding benzodiazepines, subjects with a lifetime diagnosis of benzodiazepine dependence had been dependent on significantly more drug classes in their lifetime than those without a history of benzodiazepine dependence. Alcohol use was particularly problematic, with 83% of those subjects who had a lifetime diagnosis of benzodiazepine dependence also having a lifetime diagnosis of alcohol dependence. It is possible that those subjects who have a lifetime diagnosis of benzodiazepine dependence are self-medicating pre-existing psychopathology to a greater extent than their non-benzodiazepine using peers. The self-medication process may have involved the use of a greater number of other drugs at levels sufficient enough to make them dependent.

Doctors should be aware that their heroin using patients, in many cases, have multiple drug dependencies and co-existing anxiety and/or depressive disorders. A lifetime diagnosis of alcohol dependence was extremely common among the sample, particularly among those subjects with a lifetime diagnosis of benzodiazepine dependence. When prescribing benzodiazepines to patients whom doctors know to be heroin users, the dangers of polydrug use in relation to heroin overdose should be borne in mind.

Benzodiazepine use remains widespread among heroin users, the result being a high rate of benzodiazepine dependence among this population. The SDS represents a quick and efficient means by which health workers and researchers can assess heroin users for benzodiazepine dependence. It is hoped that, through education about the risk of benzodiazepine dependence and the associated withdrawal syndrome, heroin users will adopt a more cautious approach to benzodiazepine use. Doctors have a crucial role to play in the education process when issuing prescriptions for benzodiazepines. Those subjects with a history of benzodiazepine dependence were found to have a higher lifetime prevalence of other drug dependencies, anxiety and depressive disorders than the remainder of the sample, indicating that benzodiazepine users are a particularly at risk sub-set of heroin users.

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ECSTASY USE IN SYDNEY I: PATTERNS AND CONTEXT OF USE

Libby Topp, Julie Hando & Paul Dillon

INTRODUCTION

Several indicators suggested that the prevalence of ecstasy use in Australia during the early 1990s was low, as were problems associated with its use (Hall & Hando, 1993). National surveys of the general population between 1988 and 1995 found that 1-3% had ever tried ecstasy (Commonwealth Department of Health and Family Services, 1996). A survey of recreational drug users (Spooner *et al.*, 1992) found that only half had tried ecstasy, compared with 75% who had tried amphetamine.

A Sydney study of ecstasy users conducted during the early 1990s (Solowij *et al.*, 1992; Solowij & Lee, 1991) found that most respondents were recreational drug users from the inner city who had experimented with a wide range of illicit drugs. MDMA use was primarily oral (98%) and episodic, usually in conjunction with a social event such as a dance party. Median number of use episodes was eight, and there were few regular users; only 12% of the sample were using more than weekly. Three quarters were using ecstasy once a month or less frequently.

Results suggested that ecstasy use was largely self-limiting. The euphoric effects experienced during the first few use episodes soon diminished, perhaps due to rapid development of tolerance. When larger doses were taken in an attempt to regain the intensity of the euphoric effects, aversive side effects overwhelmed the positive effects. As a result, many subjects discontinued use after several doses, or used intermittently to allow tolerance to dissipate.

An ethnographic study of a social network of psychostimulant users in Perth discussed contextual details associated with ecstasy use (Moore, 1993). The core members of this group were six young adults from varied socio-economic backgrounds. Ecstasy and other psychostimulants were most often used recreationally in social settings. Few problems were associated with use of ecstasy, and the drug was known for a less aversive "come down" than LSD or amphetamine. However, the practice of injecting ecstasy was noted among this sample, leading to bruising, scarring and collapsed veins.

While there has been little Australian research into ecstasy since the early 1990s,

anecdotal reports and other brief indicators suggest changing patterns of ecstasy use in this country. Boys *et al.* (1997) recruited a sample of patrons of "raves" in Perth, the mean age of which was 19. A third of this relatively young sample had injected a drug at some time, and although it was not specified which drugs were injected, three quarters (76%) of this sample had used ecstasy, a higher proportion than had tried amphetamine (69%). Increased injection of ecstasy was noted in the Illicit Drug Reporting System (Hando *et al.*, 1997), a pattern which has also been observed in other countries (Green *et al.*, 1995). Other evidence suggests that the age of ecstasy users may be decreasing (Baxter *et al.*, 1994). Anecdotal reports in Sydney also indicate a more demographically diverse group of people using ecstasy in this city.

Little information is available on such issues as price, purity and availability of ecstasy. These are difficult to determine from police reports due to the small number of ecstasy-related arrests and undercover operations. However, analyses of seized ecstasy and analogues (Hando *et al.,* 1997) show great variability in mean purity, from 4% to 57% during 1995. Impurities have been linked to health problems in the UK (Ashton, 1994). Given the fluctuations in purity here, the potential for similar problems in Australia seems likely. All such indicators highlight important issues requiring epidemiological attention.

In short, little is known about possible changes in patterns of ecstasy use since the early 1990s. The present study aimed to rectify this lack of knowledge by conducting a detailed study of ecstasy users in Sydney. The specific aims of the study were:

1. to examine the characteristics of MDMA users;

2. to examine the patterns of ecstasy and other drug use;

3. to examine the context of ecstasy use;

4. to examine the current price, purity and availability of ecstasy in Sydney; and

5. to compare key findings of the present study with those reported by Solowij *et al.* (1992).

METHOD

Procedure

This sample was interviewed as part of a larger national study examining patterns and correlates of ecstasy use (Topp *et al.,* 1998). Subjects contacted the researchers by telephone and were screened for eligibility for the larger study; criteria for entry were use of ecstasy at least three times in the preceding twelve months including once in the last six 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 75 and 90 minutes. Interviews took place in varied locations, agreed upon with the subjects, and were conducted by the authors.

Measures

Subjects were assessed with a structured interview schedule designed specifically for the study. This was a detailed questionnaire referring to the six months preceding the interview. It covered the following areas:

Demographics and sample characteristics, including source through which the subject was recruited, age, gender, suburb of residence, language spoken at home, education, employment and children, as well as "types" of ecstasy users;

Ecstasy use, which included frequency and amounts of use, transitions between routes of administration; concurrent polydrug use and drugs used in the recovery period following ecstasy use; tolerance to and withdrawal from ecstasy; and "binge" behaviour;

Other drug use, which covered routes of administration and frequency of recent use of 19 drug classes;

Context of ecstasy use, including reasons for use, activities typically undertaken while intoxicated, people with whom the drug is used, and best and worst things about ecstasy; and

Price, purity and availability of ecstasy, which assessed average cost and cost range of ecstasy, and subjects' perceptions of recent changes in purity and availability.

Data analyses

For continuous, normally distributed variables, *t*-tests were employed and means reported. Where continuous variables were highly skewed, medians are reported and the Mann-Whitney *U* test, a non-parametric analogue of the *t*-test, employed. Categorical variables were analysed using χ^2. All analyses were conducted using *SPSS for Windows, Release 6.0* (Norusis & SPSS Inc, 1993).

RESULTS

Sample characteristics

The sample comprised 213 ecstasy users recruited from all regions of metropolitan Sydney, Australia, through advertisements in local and entertainment newspapers (16.0%), radio (8.0%), the researcher/interviewer (13.1%) and "snowballing" procedures (62.9%). Of the sample, 31.5% resided in the inner city/east; 21.6% in the north; 7.5% in the south; 13.1% in the inner west; and 26.3% in the west and south-west of Sydney. All subjects were volunteers who were reimbursed AUD$30

for their participation. The majority of the sample spoke English at home (89.7%), with a number of other language backgrounds represented, including Spanish (3.8%), Polish (0.9%) and Japanese, French, Croatian, Arabic, Vietnamese, Turkish, Macedonian, Slovenian, Serbian, Italian, Cambodian and Chinese (0.5% each). A minority of the sample (2.3%) were of Aboriginal or Torres Strait Islander descent.

The mean age of the sample was 22.4 years (SD 5.8; range 15-46), and 52.1% were female. Female subjects were significantly younger than male subjects (20.5 versus 24.5 years; t_{186}=5.13; p<.001; Levene's test for equality of variances significant; hence the reduced *df*). Median number of school years completed was 13 (range 8-13), and the majority of the sample (56.8%) had completed the equivalent of the higher School Certificate. More than one-third (42.7%) of the sample had also completed courses after school, with 23.5% possessing a trade or technical qualification and 19.2% having completed a university degree or college course. One-third (33.3%) of the sample were presently employed on a full-time basis, and a similar proportion (37.1%) were students. Smaller proportions were unemployed (16.4%), working on a part-time or casual basis (12.7%) or engaged in home duties (0.5%). Very few subjects had ever been imprisoned (2.3%) or had dependent children (4.2%).

Subjects were asked to name which "scene" or group of ecstasy users they most identified with. "Scenes" were derived from previous work with amphetamine users, as well as reference to international literature on ecstasy users (eg. Beck & Rosenbaum, 1994; Saunders, 1995). This proved a somewhat ambitious undertaking, as some subjects were reluctant to categorise or "pigeon-hole" themselves, and some were unable to name a single scene with which they identified. However, the item provided a flavour of the wide range of ecstasy users present in Sydney, and refuted the common view that ecstasy is solely a dance drug, used only in the rave scene. Certainly, dancers of various types did make up the majority of the sample, including nightclubbers and dance party patrons (41.3%), ravers (14.1%) and patrons who identified solely with gay dance venues (8.9%). However, these groups were exceptionally broad and included such contrasts as 15-year old female school students who attended raves through to professional males in their 30s who attended gay dance venues.

Also represented were people who preferred to identify solely as students (5.6% of the sample), students who also identified with a dance scene such as clubs or raves (6.6%), people who identified with both clubs and raves (4.2%), people who identified with both the pub/live music and the dance scene (2.3%), musicians and artists (1.4%), those who identified solely with the pub scene (0.9%), a biker (0.5%), and a large group who were unable to name a "scene" that they considered themselves to be part of (12.7%). Most of this group emphasised that ecstasy users were "just normal people"; that is, they felt that virtually anyone might use this drug.

Ecstasy use

Patterns of ecstasy use

The median age at which subjects first tried ecstasy was 17 years (range 13-40), with a mean use duration of 3.5 years (SD 2.6; range six months-12 years). Females began to use at a significantly earlier age than males (median 17 versus 18 years; U=3843.5; p<.001). The majority of subjects (91.1% of the sample) had used ecstasy at least monthly at some time, and the median age at which they first did so was 18 years (range 13-39). Subjects had used ecstasy on a median of 12 days in the six months preceding the interview (range 1-100 days), approximating fortnightly use. Of the sample, 26.8% had used ecstasy once a month or less in the preceding six months, 36.1% had used between once a month and once a fortnight; 24.4% had used between once a fortnight and once a week; 10.4% one or two days a week; and 2.3% had used more than two days a week (maximum four days a week).
Median number of tablets used in an average use episode was 1.5 (range 0.5-8 tablets), and in their heaviest use episode, subjects had used a median of 2 tablets (range 0.5-30 tablets). One-third of the sample (36.2%) had "binged" on ecstasy, defined as using the drug on a continuous basis without sleep for 48 hours or more (Ovendon & Loxley, 1996). Median length of longest binge was three days (range 2-14 days).

Just over one-quarter (28.6%) had injected a drug, and 12.7% had injected ecstasy. The mean age at which they first injected ecstasy was 22.6 years (SD 5.7; range 15-40). Ecstasy was the first drug injected for only a minority of the injectors (4.9%), most having commenced injecting with amphetamine (54.1%), heroin (21.3%), cocaine (8.2%) or MDA (6.6%). All subjects had swallowed ecstasy and 99.1% had done so in the preceding six months; 56.3% had snorted ecstasy and 34.3% had done so in the preceding six months; and 25.4% had smoked ecstasy mixed with cannabis, with 12.7% having done so in the preceding six months. The majority of subjects had mainly swallowed ecstasy in the preceding six months (92.5%), followed by mainly snorted (3.3%) and mainly injected (2.3%). Ecstasy was the preferred drug of 53.1% of this sample, followed by amphetamine (11.7%), cannabis (8.5%), LSD (7.5%) and cocaine (5.2%).

Transitions between routes of administration of ecstasy

The great majority (87.3%) of the sample had only ever administered ecstasy through oral or intranasal routes. Reasons given by this group for not experimenting with injecting ecstasy included a dislike of needles and injecting (65.5% of those who had not injected), a fear of health problems or dependence (62.9%), satisfaction with oral/intranasal routes (52.2%), not having friends who injected (21.5%) and the inconvenience of preparing ecstasy for injection (9.7%). Among those who had injected ecstasy (12.7%; n=27), reported reasons for first trying injecting included: curiosity (77.8% of those who had injected ecstasy, n=21), for the rush/high (63.0%, n=17), their friends were injecting (59.3%, n=16), they considered injecting to be more economical (37.0%, n=10), they liked needles (33.3%, n=9), or that they

considered injecting better, easier or quicker (7.4%, *n*=2). One subject reported each of the following reasons for trying injecting: health problems from oral/intranasal routes, that their drug of choice (cocaine) was not available, and that they were trying to prevent themselves from using amphetamine.

Fifteen subjects (7.0% of the entire sample) had made a reverse transition - that is, they had switched from injecting ecstasy back to oral or intranasal administration. Of those who had made the reverse transition, reported reasons for doing so included: health problems from injecting (66.7%, *n*=10), feeling dependent on ecstasy (26.7%, *n*=4), coming down too quickly and intensely after injecting (26.7%, *n*=4), they were in an inconvenient setting for injecting (20.0%, *n*=3), their friends did not inject (13.3%, *n*=2) and that the acute effects of intravenous ecstasy were too intense too enjoy (13.3%, *n*=2). No subjects in this sample had administered ecstasy intravenously only.

Tolerance to and withdrawal from ecstasy

Three-quarters (76.5%) of the sample had noted diminishing effects of ecstasy over the course of their use histories, manifested as needing more to get the same effects or the same amount of drug having less effect. Of this group, 12.3% used the same amount of ecstasy as when they first started, 18.4% used a little more, 42.9% used double the amount that they started with, and 26.4% used more than double. The effects of ecstasy most frequently reported to be less intense were: the euphoria/pleasure (90.2% of those who reported diminished effects), the length of time for which effects lasted (79.8%), the stimulant effect of energy (31.9%), the confidence with which ecstasy imbues the user (12.3%), and the sociability/volubility (11.7%). Reasons for the diminished effects were reported to be: variations in quality and purity (92.0% of those who reported diminished effects), tolerance ("Your body gets used to it"; 82.2%), and that it depends on your mood (47.9%), the setting (47.2%), other recent drug use (30.1%) or food intake (5.5%).

The majority of subjects also reported that the nature of the "come down" period following use of ecstasy had changed over the course of their use history. Very few subjects (1.9%) reported that they did not "come down" from ecstasy at all, while 23.5% said that their come down was the same as it had always been. Just under one-third (30%) of the sample reported that the come down was less intense now than it had been at the start. In the majority of these cases, the come down was perceived as less intense because subjects had learnt methods for making it more bearable, rather than because the symptoms themselves were less intense. Almost one-half of the sample (44.6%) reported that the come down was more intense now, either a little more intense (26.8%) or a lot (17.8%). This was despite the fact that these subjects were no less capable than others to offer tips for dealing with it.

Other drug use

Polydrug use was the norm among this sample (Table 1), as has been found with users of other illicit drugs (Darke & Hall, 1995). The sample had experimented with

a mean of 10.4 drugs (SD 2.4; range 1-17), most frequently alcohol, cannabis, LSD, amphetamine, tobacco and amyl nitrate. In the preceding six months, the sample had used a mean of 8.1 drugs (SD 2.1; range 1-14), most frequently alcohol, cannabis, amphetamine, tobacco, LSD, and amyl nitrate.

Table 1: Patterns of drug use of the 213 ecstasy users in the study

Drug Class	Ever Used (%)	Used last 6 months (%)	No. days used last 6 months (median)
Ecstasy	100.0	100.0	12
Alcohol	99.5	93.0	24
Cannabis	98.6	93.0	48
LSD	96.7	70.0	4
Amphetamine	96.2	87.3	8
Tobacco	85.4	74.6	180
Amyl nitrate	81.2	51.6	3
Cocaine	69.5	45.1	2
Nitrous oxide	63.8	36.6	4
Benzodiazepines	59.2	46.1	5
MDA	58.7	38.5	3
Other opiates	35.7	25.4	4
Heroin	28.2	15.0	7
Antidepressants	19.7	9.9	12
Ketamine	16.0	6.6	2
Ethyl chloride	13.1	8.0	3
Methadone	6.6	3.2	90
Anabolic steroids	2.8	1.4	20
GHB	1.9	1.4	2
Other drugs *	2.3	1.9	3.5

* Other drugs included hallucinogenic mushrooms, datura and DMT

The majority of subjects typically used other drugs both in combination with ecstasy (96.2% of the sample) and in the "come down" period after using ecstasy (88.7%). "Typically" was defined as at least two-thirds of the time. A mean of 2.4 drugs were typically used in conjunction with ecstasy (SD 1.2; range 0-7), most commonly tobacco (67.6% of the sample); cannabis (48.4%); amphetamine (43.2%); alcohol (40.4%); amyl nitrate (11.7%); and LSD (10.3%). Of those that typically drank

alcohol while using ecstasy, 45.9% typically consumed more than five standard drinks in an episode. A mean of 1.8 drugs were typically used while coming down from ecstasy (SD 1.1; range 0-6), most commonly cannabis (63.4%); tobacco (61.5%); alcohol (19.7%); benzodiazepines (12.7%); and amphetamine (6.6%).

Subjects were asked which drugs, both licit and illicit, they had used prior to beginning ecstasy use, and which drugs they had experimented with after commencing use of ecstasy (Table 2). Ecstasy was the first drug tried for only one subject (0.5%). Most subjects had used alcohol (99.1%), cannabis (92.9%) tobacco (82.2%), LSD (77.5%) and amphetamine (68.5%) before experimenting with ecstasy. For one-third (31.5%) of the sample, ecstasy had come to replace drugs used earlier in their repertoire, most commonly LSD (23.9% of the sample), alcohol (7.5%), cannabis (4.2%) and amphetamine (3.8%). Among the remainder (68.5%) of the sample, ecstasy was simply added to their repertoire of drugs. A minority (7.0%) of subjects had not experimented with other drugs after using ecstasy. Drugs tried after ecstasy included: MDA (52.6% of the sample), cocaine (52.1%), amyl nitrate (44.6%), benzodiazepines (40.4%) and nitrous oxide (33.8%).

Table 2: Drugs tried before and after ecstasy (*N*=213)

Drug class (% sample used)		Used before ecstasy (% sample)	Used after ecstasy (% sample)
Alcohol	(99.5)	99.1	0.5
Cannabis	(98.6)	92.9	6.1
LSD	(96.7)	77.5	19.2
Amphetamine	(96.2)	68.5	27.7
Tobacco	(85.4)	82.2	3.2
Amyl nitrate	(81.2)	36.6	44.6
Cocaine	(69.5)	16.9	52.1
Nitrous oxide	(63.8)	30.0	33.8
Benzo's	(59.2)	17.8	41.4
MDA	(58.7)	6.1	52.6
Other opiates	(35.7)	20.7	15.0
Heroin	(28.2)	8.9	19.2
Ketamine	(16.0)	0.5	15.5
Methadone	(6.6)	4.7	1.9

Subjects were asked what amounts of a number of "party drugs" they had taken in the preceding six months, both in a "typical" use episode and in their heaviest use

episode. Median values and ranges are displayed in Table 3. Table 3 indicates that in the case of certain drug classes, including LSD, MDA, amyl nitrate and nitrous oxide, the median amounts taken in both "typical" and heaviest episodes remained equivalent, but that there was greater variability in the ranges of amounts taken in heaviest use episodes. For example, while median number of nitrous oxide canisters consumed in both typical and heavy episodes was 10, the greatest number of canisters of nitrous oxide consumed in a typical episode was 50, but in heaviest episodes, up to 240 canisters were consumed. Just under half (42.7%) of the sample had binged on one or more of these party drugs in the preceding six months. Over one-third (37.6%) had binged on amphetamine; 10.3% had binged on LSD; 7.0% on amyl nitrate; 6.6% on cocaine; 5.6% on nitrous oxide; and 5.2% on MDA.

Table 3: Median amounts of party drugs consumed in preceding six months

Drug class (measure)	"Typical" episode (median)	"Typical" episode (range)	Heaviest episode (median)	Heaviest episode (range)
Ecstasy (tablets)	1.5	0.5 - 8	2	0.5 - 30
Amphetamine (grams)	0.5	0.1 - 4	1	0.1 - 28
Cocaine (grams)	0.25	0.1 - 5	0.5	0.1 - 9
LSD (tabs)	1	0.25 - 5	1	0.5 - 10
Amyl nitrate (snorts)	5	1 - 100	6	1 - 150
MDA (capsules)	1	1 - 3	1	1 - 5
Nitrous oxide (canisters)	10	1 - 50	10	1 - 240
Ketamine (snorts)	2.5	1 - 12	4	1 - 20

Motivation for and context of use of ecstasy

Main reasons for using ecstasy

There was a high degree of consistency in reported reasons for first trying ecstasy. Most subjects reported that they were curious (91.5%), that their friends were using and had told them all about it (83.1%), and that the drug was easily accessible (58.7%). Smaller proportions reported that they first tried it to help them party and have fun (3.8%), because they were using other drugs or drinking at the time (2.3%), to help them stay awake (0.9%), because they were bored (0.5%), to help them cope with problems (0.5%), because they considered it cheap (0.5%) and to help them feel confident and uninhibited (0.5%).

Overwhelmingly, the main reason for continuing to use ecstasy following original experimentation was the euphoria (98.1%). Other reported reasons included the stimulant effects of energy (34.7%), confidence and loss of inhibitions (26.8%), and

that there are fewer negative effects from ecstasy than other drugs (for example, perception is not radically altered as with a drug such as LSD, it does not induce aggression and violence such as alcohol, the recovery period after is not as aversive as that of amphetamine; 22.1%). Smaller proportions reported that they continued to use due to boredom or for a release from the routine of daily life (18.8%), because their friends were using (16.6%), to help them communicate better and feel more empathic (12.2%), for the heightened sensations (particularly touch, sight and sound; 6.6%) and because ecstasy was readily available (6.6%).

Best things about ecstasy

The best things about ecstasy were reported to be: the euphoria/rush (76.5% of the sample), the group experience and friendship (42.7%), energy (32.4%), feelings of confidence and loss of inhibitions (31.9%), escape from reality and routine (21.1%), heightened sensations (20.2%), relaxation or stress release (17.8%), positive outlook and sense of extreme well-being (17.8%), improved communication and empathy (16.4%), and insight and clarity of thought (7.0%).

Worst things about ecstasy

Almost all subjects (97.7%) reported that there were things about ecstasy that they did not like. The worst things were reported to be: the "come down" (59.6%), cost (56.3%), quality issues and impurities (49.8%), physical health risks and problems (34.3%), psychological problems (24.4%), its legal status (16.4%), the development of tolerance (13.1%), and family and friends interfering and moralising about drug use (1.4%).

Activities undertaken while intoxicated

The most common activity undertaken while intoxicated by subjects in this sample was to dance (82.6%). This was done in a variety of environments, including dance clubs, dance parties, raves, pubs or music gigs, at friend's houses or at home. Other activities included socialising and meeting new people (67.1%), feeling empathic and close to people (59.6%), cuddling, kissing and touching (46.0%), "chilling out" and relaxing (35.2%), staying home or at friend's houses (31.9%), listening to music (30.0%), having sex (17.8%), thinking (about life and what they wanted out of it; 17.4%), and going to the pub or music gigs (8.5%).

Social context of ecstasy use

Most subjects reported that they used ecstasy with a small group of friends (two to four people; 60.1%). Other people with whom ecstasy was frequently used included a larger group of friends (46.0%) and partner (39.4%). Smaller proportions reported that they used with family members (7.0%), that they used alone (2.8%), or with workmates (1.9%) or acquaintances (1.4%). Over half (54.0%) of the sample had a regular partner. Most (82.6%) of these regular partners also currently used ecstasy. Half (50.2%) of the sample reported that they knew more than 50 people who used

ecstasy, one-third (33.3%) knew between 21 and 50 people, and 13.1% knew between 11 and 20 people. Moreover, the great majority (82.2%) reported that half or more of the people that they spent time with currently used ecstasy, and 22.1% said that all their friends used. The most common source from which ecstasy was obtained was clearly friends (88.7% of the sample). Three-quarters (72.5%) of the sample had introduced at least one other person to ecstasy for their first time, with a median of 2 people introduced (range 0-150 people). Over one-half (59.2%) of the sample had introduced between one and five people to ecstasy.

Table 4: Price, purity and availability of ecstasy

Price (AUD$):	
Mean price	$49.6 (SD 8.8; range 20-60)
Mean lowest price	$42.3 (SD 8.8; range 15-60)
Mean highest price	$62.3 (SD 8.8; range 40-100)
Price changes (%):	
Increasing	7.1
Stable	64.2
Decreasing	24.5
Fluctuating	2.4
Don't know	1.9
Purity (%):	
High	10.8
Medium	47.4
Low	22.1
Don't know	19.7
Purity changes (%):	
Increasing	9.4
Stable	15.0
Decreasing	16.4
Fluctuating	50.2
Don't know	8.9
Availability (%):	
Very easy	61.0
Easy	35.2
Difficult	3.8
Availability changes (%):	
More difficult	5.2
Stable	67.6
Easier	24.4
Fluctuates	2.8

Price, purity and availability of ecstasy

The mean price of ecstasy was reported to be approximately AUD$50, with a typical range of between $40 and $60 (Table 4). The majority of the sample reported that price had remained stable or decreased recently. Most subjects also perceived that the purity of ecstasy was low or medium, that purity fluctuated widely or had recently decreased, that ecstasy was readily available, and that availability had remained stable or increased recently.

Trends since 1990

Table 5 displays key characteristics of the present sample and that recruited by Solowij *et al.* (1992) in Sydney in 1990. It indicates that in the present sample, subjects were younger and a higher proportion were female than in the earlier sample. Fewer subjects were working full-time, and a higher proportion were students. The majority of the earlier sample were recruited from inner city areas, whereas the present sample were recruited from all regions of metropolitan Sydney (Table 5).

Table 5: Comparison of ecstasy users recruited in 1990 and 1997

Variable	Present sample	Solowij *et al.* (1992)
Demographics		
Mean age	22	27
% female	52	39
% working full time	33	63
% students	37	23
% from inner city areas	44	74
Ecstasy Use		
% use ecstasy monthly or less	27	76
% use weekly or more frequently	13	12
% using one or less tablets at a time	50	80
% injected ecstasy	13	negligible
% developed tolerance to ecstasy	77	49
% unable to identify dislikes about ecstasy	2	10
Other Drug Use		
% never use other drugs with ecstasy	4	24
% used LSD	97	84
% used amphetamine	96	83
% used heroin	28	16
Mean price of ecstasy	AUD$49	AUD$38

Table 5 also indicates differences in patterns of ecstasy use between the two samples. Although a comparable proportion of the two groups used weekly or more often (12 versus 13%), three quarters of the earlier sample used ecstasy once per month or less frequently, compared with only one quarter of the present sample. While only half of the present sample typically used one or fewer tablets of ecstasy per use occasion, 80% of the earlier sample had done so. Thirteen percent of the present sample had injected ecstasy, compared with a negligible proportion of the earlier sample (exact figures not reported). Further, whereas 10% of the earlier sample were unable to identify features of ecstasy that they disliked, only 2% of the present sample could not do so. The mean cost of ecstasy has risen since the early 1990s ($38 versus $49).

Patterns of other drug use were also different between the two samples. Concurrent polydrug use with ecstasy was the norm among the present sample, typically undertaken by 97% of subjects. However, one quarter of the earlier sample reported that they never used other drugs with ecstasy. Further, greater proportions of the present sample than the earlier one had used a number of drugs, including LSD (97% versus 84%), amphetamine (96% versus 83%) and heroin (28% versus 16%). Although prevalence of use of some drug classes was not assessed in the earlier study, including MDA, ketamine and antidepressants, remarkably high rates were reported by the present sample.

DISCUSSION

This sample of 213 ecstasy users was recruited with ease from all regions of metropolitan Sydney, mainly through snowballing techniques. On the whole, the sample was young, relatively well educated, few were unemployed, and about half (52.1%) were female. A wide variety of cultural backgrounds were represented, including a minority of participants of ATSI descent. The sample differs in a number of ways from that recruited in Sydney in 1990 by Solowij *et al.* (1992). The earlier sample were older (27.1 versus 22.4 years), primarily from the inner city, 39% were female, and most (63%) were working full-time. Few cultural backgrounds were represented in the earlier sample, and no subjects of ATSI descent were recruited. These differences may reflect the biases of "snowball" sampling, the primary recruitment method of both studies. However, differences may also be due to the present sample containing a higher proportion of subjects from the culturally diverse and socially disadvantaged west and south-west of Sydney (26.3% versus 9%), as well as changes in the nature of the ecstasy-using population in this city since the start of the decade.

The notion that there have been changes in the ecstasy-using population since the 1990s is supported by results of the National Household Surveys undertaken as part of the National Drug Strategy. For example, whereas in 1991, 4% of females aged between 14 and 24 years had tried ecstasy (Commonwealth Department of Health, Housing and Community Services, 1992), by 1993, this figure had risen to 9% (Commonwealth Department of Human Services and Health, 1994). This increase in the number of young females using the drug is reflected in the demographic

characteristics of the two samples. The sample recruited in 1990 by Solowij *et al.* (1992) contained a higher proportion of males, and was on average, 5 years older than the present sample.

An extremely broad range of ecstasy users participated in the present study, with a correspondingly diverse range of use patterns. Subjects began to use ecstasy in their late teens, and most quickly began to use the drug regularly. Consistent with Solowij *et al.* (1992), use of ecstasy in this sample was primarily through oral routes, although an increase in intravenous administration has definitely occurred since the early 1990s, with 12.7% of this relatively young sample having injected ecstasy at some time. The health and psychological implications of injecting ecstasy have been highlighted by Hunt *et al.* (1997). Reassuringly, more than half of those who had made the transition to injecting ecstasy had also made a reverse transition, reverting back to oral/intranasal routes of administration. This was most often due to health problems, dependence and the intensity of the "come down" after injecting.

Frequency of use was varied in this sample, from once in six months to four days per week. A comparable proportion of this sample as in the Solowij *et al.* (1992) study were using more than weekly (12.5% versus 12%), although a far greater proportion of the earlier sample used monthly or less frequently (76% versus 27%). Moreover, it seems that there have been increases in the quantity of ecstasy used per occasion since the early 1990s. Over two-thirds of the earlier sample reported taking only one tablet per average use episode, with a maximum of five tablets. In the present sample, half (50.2%) reported using more than one tablet in an average use episode, with a maximum of eight tablets consumed in a typical occasion of use. Further, 19.2% of the current sample had consumed more than four tablets in a use episode in the preceding six months, with a maximum of 30 tablets consumed in a weekend "binge" by one subject. Whereas "binge" behaviour was not assessed in the earlier study, remarkably high rates were reported by the present sample, with over one-third having binged on both ecstasy and amphetamine for 48 hours or more. It is likely that subjects who engaged in such binges were compromising their immune system in doing so, due to a lack of sleep, food and adequate fluid intake for significant periods of time.

More subjects in the present sample had noticed diminishing effects of ecstasy than in the sample recruited by Solowij *et al.* (1992; 76.5% versus 49%). This may reflect changes in the composition of street ecstasy since the early 1990s. Indeed, a majority of those in both studies who reported diminished effects considered it to be due, at least in part, to variations in quality and purity. However, it is also possible that increases in frequency and amounts of ecstasy use has led to the development of a higher degree of tolerance among regular users. Certainly, a much larger proportion of the present sample attributed diminished effects to "tolerance" than in the earlier study (82.2% versus 59%). A wider knowledge base may now exist among ecstasy users, given that the drug has been used in this country for 10 years, and perhaps users are more aware of the possibility of developing tolerance than they were earlier on. Substantial proportions of both samples also suggested that diminished effects depended on mood and setting.

Interestingly, however, no subjects in the earlier study referred to the contribution of other recent drug use to diminished effects of ecstasy, compared with one-third of the present sample. This may be due to different patterns of polydrug use between the two samples. While detailed patterns of other drug use were not collected in the earlier study, what was reported certainly contrasts markedly with the patterns of polydrug use of the present sample. High levels of consumption of numerous other drugs were recorded, both in conjunction with ecstasy and completely separate from it. It is accurate to characterise the present sample as polydrug users, a majority of whom had a preference for ecstasy. For example, 24% of the Solowij *et al.* (1992) sample never used other drugs in conjunction with ecstasy, whereas concurrent polydrug use was typically undertaken by 96.2% of the present sample, emphasising the need for better education on the risks of polydrug use. Moreover, half of those who drank alcohol with ecstasy typically did so at "binge" drinking levels. This is a hazardous pattern of alcohol consumption in itself, let alone in combination with a drug known to cause dehydration. Remarkably high rates of party drug use were also reported, further highlighting the need for a better understanding of the patterns and correlates of such drug use. Almost all subjects in this sample had used LSD and amphetamine, over 80% had used amyl nitrate, and more than half had used cocaine, nitrous oxide and MDA. Given our lack of understanding of these drugs, urgent attention must be given to the possible harms associated with such use.

Other drugs were also typically used to ease the "come down" period after using ecstasy (88.7%), including cannabis, alcohol and benzodiazepines. The rates of depressant use among a primarily party drug-using sample were surprisingly high, and suggest that ecstasy users are adept at obtaining drugs which help them to self-medicate the aversive physical and psychological effects of an ecstasy (and other drug) use episode. The fact that 60% of the sample had used benzodiazepines was somewhat unexpected. Further, 28% had used heroin, 36% had used other opiates and 20% had used antidepressants. Our impressions are that the relatively high prevalence of heroin use was due to its availability. This seemed to be the case particularly in south-west Sydney, where many young subjects smoked heroin as a means of relaxing or self-medicating the side effects of stimulant use. Benzodiazepines and antidepressants were obtained from the street and to a lesser extent through "doctor shopping", primarily to self-medicate the stimulant come down.

A range of reasons for ecstasy use were reported by the sample, many consistent with those reported in the Solowij *et al.* (1992) study. In both studies, subjects reported that a combination of curiosity, availability and having friends who used encouraged them to experiment with ecstasy. Moreover, in both studies, ecstasy-induced euphoria was the overwhelming reason for continued use. Other reported reasons for continuing to use highlighted the nature of ecstasy as both a stimulant and an hallucinogen, as well as an "entactogen" (or "touchy drug"; Hermle *et al.*, 1993). Thus, energy, confidence, heightened sensations, the group experience of warmth and friendship, improved communication and empathy, and insight and clarity of thought, were all important reasons for continued use by the present sample. Further, these effects of ecstasy were most often described as the best

things about the drug.

These effects also relate to the activities undertaken while intoxicated, which again were consistent between the two samples. Thus, dancing was the activity most frequently undertaken while using ecstasy, although it should be noted this was not only in environments such as raves or clubs. Subjects also danced at live music gigs, at home or friends' houses and at pubs. Ecstasy is not used exclusively by patrons of the various dance music "scenes" in Sydney. Contexts of use were varied, ranging from using at home with a partner for empathy and intimacy, using during the day with friends to go shopping or to the beach, or taking small doses before going to the movies or dinner parties. Its enhancement of social events makes ecstasy conducive to use in a wide variety of situations. Other popular activities included socialising and meeting new people, feeling empathic and close to friends, touching, relaxing, "hanging out" at home, having sex and thinking. Although the social effects of ecstasy, in combination with the hallucinogenic and stimulant effects, made dancing in an aurally and visually stimulating environment a favourite activity for many subjects, there were also many subjects who had never taken the drug in a dance environment.

There is no doubt that ecstasy is a drug used within a particular social context. Very few subjects in either sample reported that they used it alone, with their dealer or acquaintances. Most used with small groups of friends, larger groups of friends or their partners. Moreover, in both studies, subjects reported extensive networks of friends who used the drug, with a majority of both samples indicating that most of the people they spent time with were current ecstasy users. The majority of those in the present study with regular partners reported that their partners also used. The social nature of ecstasy use also relates to the sources from which the drug is obtained; almost all subjects (88.7%) usually obtained ecstasy through their friends. Most subjects emphasised that an important harm reduction technique was to obtain the drug from a known and trusted source, capable of reporting on the effects of new "batches".

The price of ecstasy has risen since the early 1990s, with subjects in the present sample reporting a mean price per tablet of approximately $50. In the Solowij *et al.* (1992) study, mean price was $38. However, a majority of subjects in the present study reported that the price of ecstasy had remained stable or decreased during 1997, suggesting that the price may have reached a peak during the mid-1990s but is now dropping slightly. In both studies, ecstasy was reported to be readily available, with only 4% of the present sample considering it somewhat difficult to obtain. Moreover, only 5% perceived a decrease in availability, suggesting that ecstasy is easy to get and has been so for some time. Subjects' perceptions of purity were not collected in the earlier study, although Solowij & Lee (1991) suggested that the ecstasy available at the time of their data collection was more than 90% pure. It seems unlikely that street ecstasy currently available would be that pure. In 1995, street seizures of ecstasy ranged from 4% to 57% pure (Hando *et al.*, 1997), and only 9% of the present sample reported a recent increase in purity. Most thought the purity fluctuated widely (50%), and 16% thought there had been a

recent decrease. While in the earlier study, purity was not raised by subjects as a feature of ecstasy that they disliked, half of the present sample considered variations in purity to be one of the worst things about the drug, suggesting that there may have been a reduction in purity since the early 1990s. However, analysis of police seizures of ecstasy will comment more authoritatively on changes in purity throughout the 1990s.

In both studies, the cost of ecstasy was considered to be one of the worst things about the drug, as was the nature of the "come down" period after use. It is interesting to note that while 10% of the Solowij *et al.* (1992) sample were unable to name anything they disliked about ecstasy, 97.7% of the present sample could identify such features. Of concern to the present sample were physical and psychological problems, the illegal status of the drug and the development of tolerance. This increase in recognition of undesirable aspects of ecstasy, and in particular of health and psychological side effects and tolerance, which might arise due to heavier use, all support the notion that greater amounts of ecstasy are now being used, with a wider range of consequent harm.

Interestingly, 40% of the Solowij *et al.* (1992) sample believed that ecstasy use in Sydney was decreasing at the time of that study. This led Solowij & Lee (1991) to postulate that ecstasy was a "fad" that would quickly be superseded by some other drug. However, the results of the present study suggest that if anything, ecstasy use has increased in Sydney throughout the 1990s. It is now being used by a more demographically diverse range of people, and contexts of use have broadened from primarily dance-oriented to a wide range of social and intimate events. Availability would appear to have increased and it seems that recently, prices may have begun to fall. Solowij & Lee (1991) suggested that the media hype surrounding ecstasy use in the late 1980s may have contributed to the numbers of people experimenting with the drug, and this suggestion is strongly supported by the present study, with the majority (59%) of subjects having first tried the drug in the years 1994-1997. This is partly a function of the young age of the sample, but it is likely that it is also partly due to the intense media interest in dance drugs and raves throughout these years. While ever the media continue to publish sensational and ill-informed stories about drugs like ecstasy and events like raves, people, and young people in particular, will continue to be attracted to these illicit and underground activities (Beck, 1986; 1990; Farrell, 1989).

In conclusion, this study has demonstrated that while the reasons for and context of ecstasy use have remained relatively stable since the beginning of the 1990s, a wider range of people now use the drug, in particular, a higher proportion of females and of younger people. It appears that both amount and frequency of ecstasy use have increased, and there has been a significant increase in rates of intravenous administration of the drug. More drugs are used in conjunction with ecstasy and in the recovery period following use, and higher rates of overall drug use have been recorded. Ecstasy is primarily used in a variety of social contexts. It is often linked to dance events such as nightclubs or dance parties, but is also used at pubs, friend's houses, at home and during the day for "normal" activities such as shopping

or going to the beach. While the "best" things about the drug have remained relatively constant, a higher proportion of current users are able to identify features of the drug they do not like, and a wider range of these "worst" things are reported. There has been an increase in the price and availability of ecstasy since the early 1990s, and it is likely that there has been a drop in purity.

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ECSTASY USE IN SYDNEY II: ASSOCIATED HARMS AND RISK-TAKING BEHAVIOUR

Julie Hando, Libby Topp and Paul Dillon

INTRODUCTION

The previous paper focused on the demographic characteristics of ecstasy users in Sydney and their patterns and contexts of ecstasy use (Topp, Hando & Dillon, this volume). It found that ecstasy users were typically young adults (mean age 22 years) who were relatively well educated and often employed or students. They resided throughout the Sydney metropolitan area and included similar proportions of males and females. While oral use was the primary route of administration of ecstasy, a substantial minority reported injecting ecstasy (13%). They had used the drug on a median of 12 days during the past 6 months, approximating fortnightly use. While most had a preference for ecstasy (53%), the sample was characterised by their polydrug use, having tried an average of 10 drug types during their lifetime. Some changes in the features of ecstasy use were noted since a previous Sydney survey conducted in 1990 (Solowij, Hall and Lee, 1992). Users now appeared to be younger and include more females. Increased use of ecstasy by injection and greater levels of concurrent polydrug use were also noted in the most recent survey (Topp et al., this volume).

The current paper addresses ecstasy-related harms and the need for interventions. Previous research noted relatively few problems associated with the use of ecstasy. For example, Solowij et al's survey of 100 ecstasy users (Solowij et al., 1992) found that most of the adverse effects were unpleasant side effects of acute use, such as loss of appetite, dry mouth, palpitations and teeth grinding. Among the small number of heavy users, only two persons reported developing dependence on the drug. The results of this study confirmed those of other studies conducted in the United States at around the same time (eg. Beck, 1990; Beck and Rosenbaum, 1994; Peroutka, 1990). It was suggested that while the pattern of ecstasy use remained one of intermittent oral use, there was little cause for concern because the use was usually self-limited and there were few extreme reactions or severe problems among users (Solowij, 1993).

However, in recent years there has been a growing number of deaths in which ecstasy has been implicated, both in Australia and overseas (Henry et al., 1992; White et al., 1997). Deaths have most often been attributed to heat stroke resulting from the circumstances in which ecstasy is used, such as dance parties. It appears

that a combination of sustained physical exertion, high ambient temperatures and inadequate fluid replacement compound a direct pharmacological effect of ecstasy on thermo-regulatory mechanisms, leading to fulminant hyperthermia. This effect is in part a result of ecstasy's neurotoxic effects on serotonergic nerve terminals, but such extreme reactions are idiosyncratic for reasons as yet unknown. On the other hand, some deaths have been attributed to excessive water consumption.

Other risks stem from the consumption of large doses of ecstasy (acute or cumulative), a history of psychiatric disturbance or pre-existing disease (Solowij, 1993). Research has also noted significant psychological morbidity associated with the use of ecstasy (Cassidy & Ballard, 1994; McGuire et al., 1994; Series et al., 1994; Williamson et al., 1997).

Little systematic research on ecstasy-related harms has been conducted since the early 1990s. There is also little information about the intervention preferences of ecstasy users necessary for the develop of public policy. Given the general lack of current information on ecstasy use in Australia, and indications of increased risks associated with the drug, the present study had three main aims:

1. to examine perceptions of risk and risk-taking behaviours among ecstasy users;

2. to estimate the nature and level of ecstasy-related harms;

3. to determine the help-seeking behaviour and intervention preferences of ecstasy users.

METHOD

Subjects

The sample consisted of 213 ecstasy users recruited from all areas of Sydney through snowballing (63%), advertisements (24%) and personal contacts (13%). All subjects were volunteers who were paid A$30 for participation in the study. The mean age of the sample was 22.4 years with 52% of subjects being female. The mean years of formal school education was 13. A minority of subjects (16%) were unemployed. Most (90%) were from an English-speaking background.

Procedure

The sample was interviewed as part of a larger survey of ecstasy users in three Australian cities (Topp et al., 1998). Subjects contacted the researchers by telephone and were screened for suitability for the study. Entry criteria was the use of ecstasy on at least three occasions during the past year. Interviews were conducted by the three authors in a convenient location nominated by the subject. Subjects were guaranteed anonymity and confidentiality of the information provided. Interviews took between 60 and 90 minutes.

Measures

A structured interview schedule was administered to subjects. It included the following areas:

Perceptions of ecstasy-related risk, both for the subject and for ecstasy users in general. This included specifying what the three main ecstasy-related risks were perceived to be;

The physical and psychological health effects of ecstasy which were derived from a previous study on ecstasy use (Solowij et al., 1992) and the Opiate Treatment Index (OTI; Darke et al., 1992). Subjects were asked whether or not the symptom had occurred during the past 6 months, when it had occurred (while using ecstasy, while coming off ecstasy or at other times), how long the worst case lasted for and whether the symptoms were only related to ecstasy or other drugs and/or conditions as well;

Ecstasy dependence which was measured using the five item Severity of Dependence Scale (SDS; Gossop et al., 1995). This ranges from 0 to 15, higher scores indicating greater dependence;

Questions about *other ecstasy-related problems,* including relationship, financial, legal/ police and work/study problems which were derived from a previous survey of amphetamine users (Hando, Topp and Hall, 1997). Subjects were asked to specify the most serious of these problems in the past 6 months;

Risk-taking behaviour which examined injecting practices with items from the OTI HIV Risk-taking Behaviour Scale (Darke et al., 1991), along with additional questions on the level and type of fluid consumption while at dance venues and whether breaks from dancing were taken;

Social functioning which examined employment status during the past 6 months and social networks, derived from the OTI Social Functioning Scale (Darke et al., 1992). Criminal behaviour was measured using the OTI Crime Scale (Darke et al., 1992). This measures the degree of criminal involvement in the past month, higher scores indicating greater involvement.

Help-seeking behaviour which was measured by asking which types of formal treatments, information or other responses subjects had received, whether they had presented the problem as ecstasy-related, specific outcomes and the degree of satisfaction with these responses. Subjects were also asked about their preferences for interventions, including what treatment or information they would currently like, changes they wanted to make to their ecstasy use and why. These questions were derived from a previous study on the treatment needs of amphetamine users (Hando, Topp and Hall, 1997).

Data analysis

For continuous variables, t-tests were employed. Where distributions were highly skewed, medians were reported. Highly skewed continuous data were analysed using the Mann-Whitney U statistic, a non-parametric analogue of the t-test. Categorical variables were analysed using X^2. Gender differences are noted when significant. All analyses were conducted using SPSS for Windows, Release 6.0 (Norusis & SPSS Inc., 1993).

RESULTS

Perception of risks

When asked to rate how "hard" an illicit drug ecstasy was perceived to be, on a 10 point scale, where cannabis was placed at 0 and heroin at 10, the mean response was 5.0 (range 0-10, SD 1.7). The main ecstasy-related risks perceived by subjects were: emotional problems (47%), impurities (42%), short-term physical problems (30%), long-term physical problems (27%), financial problems (26%), unknown long-term effects (26%), dependence (23%), toxic reaction (15%), legal problems (14%), death (11%), cognitive problems (11%) and being too trusting and vulnerable (10%). In comparison, most subjects perceived their own use of ecstasy to be moderately (31%), quite (39%) or very safe (24%), with only 5% believing that ecstasy use was quite to very risky.

Physical and psychological health problems

Subjects were administered a scale which consisted of 35 of the most common ecstasy-related health symptoms highlighted in previous research (Solowij et al., 1992). The mean number of symptoms reported by subjects in the previous 6 months was 12.5 (range 0-25, SD 5.5). Females reported significantly more symptoms than males (13.7 v 11.2, $t[211]=-3.32$, $p<.001$).

Table 1 lists the reported symptoms, when they occurred, how long the worst case lasted for and whether the symptoms were only related to ecstasy or other drugs and/or conditions as well.

The most common ecstasy-related symptoms experienced half or more of subjects in the past 6 months were loss of energy, irritability, muscle aches, depression, trouble sleeping, confusion, blurred vision and hot/cold flushes. These were mostly acute symptoms which occurred while using ecstasy and/or while coming off ecstasy.

Specifically, the most common symptoms reported by a third or more of the sample while using ecstasy were blurred vision, hot/cold flushes, sweating, numbness/tingling, weight loss, heart palpitations, trouble urinating and dizziness. Common symptoms reported while coming off ecstasy were loss of energy, irritability, muscle aches, depression, trouble sleeping, confusion, anxiety, weight loss, paranoia, headaches and joint pains. Significant minorities reported more

chronic symptoms which occurred at other times, although were still perceived to be related to ecstasy use, including weight loss, depression, loss of energy, memory lapse, trouble sleeping and irritability. Among those who experienced a symptom, the worst episode usually lasted from 30 seconds (for fainting) to up to 3 days (for loss of energy, depression, violence) (Table 1).

Table 1: Health symptoms

	Symptom (n) % *	While using ecstasy % *	While coming off ecstasy % *	At other times % *	Median length of worst case #	Only related to ecstasy % #
Loss of energy	(169) 79	6	78	19	3 days	47
Irritability	(159) 75	1	73	19	2 days	47
Muscle aches	(149) 70	6	67	9	2 days	34
Depression	(134) 63	3	57	24	3 days	49
Trouble sleeping	(127) 60	17	57	15	12 hrs	41
Confusion	(144) 54	31	41	7	12 hrs	54
Blurred vision	(109) 51	49	13	2	1 hr	70
Hot/cold flushes	(106) 50	40	27	3	1 hr	48
Anxiety	(101) 47	27	34	12	6 hrs	47
Sweating	(98) 46	41	24	4	3 hrs	40
Dizziness	(98) 46	33	24	9	20 mins	48
Numbness/tingling	(96) 45	41	11	3	60 mins	62
Weight loss	(96) 45	42	42	36	-	25
Paranoia	(96) 45	25	33	8	4 hrs	38
Heart palpitations	(93) 44	39	16	5	30 mins	38
Stomach pains	(93) 44	30	25	4	2 hrs	47
Headaches	(90) 42	10	36	5	6 hrs	39
Tremors/shakes	(90) 42	30	24	7	3 hrs	43
Joint pains	(80) 38	4	37	7	2 days	25
Trouble urinating	(80) 38	38	4	<1	3 hrs	81
Teeth problems	(69) 32	9	25	12	2 days	39
Vomiting	(65) 31	29	7	1	5 mins	68
Short. breath	(66) 31	26	8	1	1 hr	33
Memory lapse	(57) 27	15	15	17	3 hrs	28
Visual hallucinat	(46) 22	22	3	1	30 mins	52
Chest pains	(39) 18	10	10	4	1 hr	18
Aud. hallucin.	(31) 15	13	5	0	24 mins	45
Loss of sex urge	(25) 12	7	8	5	48 hrs	40
Flashbacks	(25) 12	2	2	10	2 mins	64
Panic attacks	(24) 11	8	2	2	na	50
Suicidal thoughts	(21) 10	0	9	5	7 hrs	29
Fainting	(12) 6	4	2	<1	3 mins	42
Fits/seizures	(2) 1	<1	<1	0	30 secs	50
Violence	(3) 1	0	1	1	3 days	0
Suicide attempts	(2) 1	0	1	1	-	0

* proportion of total sample; # among those reporting the symptom; na not available

The majority of subjects who reported the following symptoms perceived these effects to be only related to their use of ecstasy: inability to urinate, blurred vision, vomiting, numbness/tingling, flashbacks, confusion and visual hallucinations. Other

symptoms were perceived to stem from a combination of ecstasy and other factors (eg. other drug use, dancing, lack of sleep or food).

Subjects were also asked whether they had experienced any changes in these symptoms since they first began using ecstasy. Over half (57%) reported an increase in ecstasy-related side effects, the most common of which were loss of energy (34%), depression (32%), irritability (31%), anxiety (20%), paranoia (15%) and muscle aches (13%). Twenty-nine percent reported no changes in side effects and 14% reported that side effects had lessened since they first began using ecstasy.

Ecstasy dependence

The mean score on the SDS was 2.2 (range 0-11, SD 2.0). Females scored significantly higher than males (2.5 v 1.8, $t[209]=-2.4$, $p<.05$). A cut-off score of more than four has been used among other groups of psychostimulant users to classify dependence (Topp and Mattick, 1997). Eleven percent would be classified as dependent when this cut-off score is applied to the present sample. Further analyses of ecstasy dependence among this sample are presented elsewhere (Topp, Hall and Hando, forthcoming).

Other ecstasy-related problems

A number of additional ecstasy-related problems were reported by subjects. Almost half (47%) had experienced a relationship/social problem during the past 6 months with a partner, friend or relative. Most of these (80%) involved relatively minor problems such as arguments, mistrust or anxiety. Minorities reported more serious problems such as ending a relationship (18%) or violence (2%).

Just under half (46%) of the sample reported a financial problem from their use of ecstasy, the most common of which was a lack of money for recreational activities (47%). Minorities reported being in debt (27%) or having no money for essentials such as food and rent (26%).

Occupational problems were reported by 47% of the sample. Females were significantly more likely than males to report work/study problems (60% v 39%, $X^2[1 df]=5.3$, $p<.05$). Most of the reported problems (58%) involved trouble concentrating, reduced work performance or feeling unmotivated. Twenty-nine percent reported having to take sick leave or not attending classes. A minority (13%) reported very serious problems such as being sacked, quitting their job or study or not being able to find a job due to their ecstasy use.

Seven subjects reported legal problems from their use of ecstasy in the past 6 months, most having received a caution from police (n=5). Two subjects had been arrested.

Risk-taking behaviour

Twenty-nine percent (n=61) of the sample had ever injected a drug. Ten percent (n=22) had injected during the month preceding the interview, usually either once a week or less (n=10) or a few times per week (n=9). Few reported daily injection (n=3) (Table 2). Among those who had injected, three subjects had used a needle after someone else on 2 to 5 occasions. Four subjects had lent a used needle to someone else, up to five times during the month. When sharing was defined as having either lent or borrowed a used needle, 4 subjects had shared needles in the past month. Two of these subjects reported never using bleach to clean needles before re-using them, while 2 subjects had always cleaned these needles with bleach (Table 2).

Table 2: Risky injecting practices in the month preceding interview

	Total
Frequency of injection: (n) %	
Daily	(3) 1
2-3 times/week	(9) 4
Weekly or less	(10) 5
No injection	(191) 90
Injectors who borrowed a used needle: (n) %	(3) 14
No. of times injectors borrowed a used needle: (n) %	(19) 86
None	(0) 0
Once	(2) 9
Twice	(1) 5
3-5 times	
Injectors who lent a used needle: (n) %	(4) 18
No. of times injectors lent a used needle: (n) %	
None	(18) 82
Once	(1) 5
Twice	(2) 9
3-5 times	(1) 4
Injectors who had shared needles (n) %	(4) 18

Subjects were asked about their fluid consumption while using ecstasy due to reports of dehydration and water intoxication which in some instances have resulted in death (White et al., 1997). Most (93%) reported that they usually drink fluids when they use ecstasy, with no differences between males and females. All of these subjects reported drinking water, at varying levels. Just over half (55%) typically consumed less than 250ml of water per hour, 39% consumed between 250-500ml of water per hour, 5% between 500-1000ml per hour and one subject more than 1000ml per hour. A third of these subjects (35%, n=70) only drank water while using ecstasy, 41% (n=82) also drank alcohol, 29% (n=58) soft drinks, 17% (n=34) fruit juice, 15% (n=29) sports drinks and 4% (n=7) coffee.

Medical opinion suggests that water consumption should vary according to the level of activity while using ecstasy (White et al., 1996). Eighty-seven percent (n=186) of the present sample attended dance venues while using ecstasy. Most (85%, n=159) reported taking breaks from dancing during the night, however a substantial minority (15%) reported dancing continuously without breaks. The proportion of males and females taking breaks was similar (83% vs 88%).

Among those who did not rest at dance events (n=27), around half (n=13) appeared to be drinking adequate amounts of water (ie. 250-500ml per hour), and the remainder consumed either too little water (n=13, <250ml per hour, 4 subjects reported no water consumption) or too much (n=1, up to 1000ml per hour). Half of those who drank too little water usually consumed alcohol (n=6), the rest reporting no fluid consumption (n=6).

Among those that did rest at dance events (n=159), just over half (56%) usually drank less water than the recommended minimum levels (<250mls per hour, 5 subjects consumed no water), and 10 (7%) subjects consumed excessive amounts of water (from 500-1000mls or more per hour). Among those drinking too little water (n=89), 33% usually drank no other fluids, 39% drank alcohol, 27% drank soft drinks, 18% drank fruit juice, 16% drank isotonic drinks and 3% drank coffee.

Social functioning

Other indicators suggest reasonable levels of social support and functioning in the community. Most subjects (93%) had held a job or had been a student at some time during the past 6 months, with only 7% of the sample reporting that they had been unemployed for all of this time. Most (76%) had several close friends whom they saw on a regular basis (79%).

In terms of criminal behaviour, 2% had a previous conviction. Fifty-seven percent had committed a crime in the past month, for which they had not necessarily been caught. No significant gender differences were noted (60% males, 55% females). Crimes committed in the past month included dealing drugs (46%), property crimes (23%), fraud (4%) and violent crimes (2%). A mean score of 1.3 (range 0-8, SD 1.6) was found on the OTI Crime Scale.

Help seeking behaviour

Fifteen percent of the sample felt that they had needed help for an ecstasy-related problem in the past, and 7% felt that their current use of ecstasy was problematic. Half (n=108, 51%) had previously attempted to reduce their level of ecstasy use, most (86%) during the past 12 months. Among this group, the most common reasons for wanting to reduce their ecstasy use were: financial difficulties (64%), physical health problems (50%), psychological problems (36%), work/study problems (31%), relationship problems (22%), to improve their quality of life (13%), poor quality drugs (13%) and feeling dependent (9%).

Few subjects (18%, n=38) had ever received formal assistance from a health

practitioner for an ecstasy-related problem. The most common treatments ever received were seeing a GP (9%) or a natural therapist (7%) (Table 3). Five percent of the sample (n=11) were presently receiving treatment for an ecstasy-related problem.

Among those who had seen a GP (n=20), most (80%) reported to their practitioner that they had taken ecstasy. Only 20% (n=4) noted reductions in ecstasy use as a result of this assistance. Other outcomes included obtaining a prescription for benzodiazepines or other pharmaceuticals (n=6), receiving a medical check-up (n=5), or increasing their knowledge about drugs (n=5). Two subjects reported increased feelings of anxiety and frustration from their consultation. Two-thirds (n=13) were reasonably satisfied with the treatment, while 7 subjects were less than satisfied (Table 3).

In terms of natural therapies, six of the 15 subjects who had had this treatment presented it as ecstasy-related to their practitioner. The most common outcomes were stress reduction and increased relaxation (n=10), detoxification (n=8), improved physical health (n=4), and reduced ecstasy use (n=4). Most subjects (93%) were satisfied with the intervention.

Seven subjects had presented to a hospital emergency ward with an ecstasy-related problem, all of whom informed the attending staff that they had taken ecstasy. Only one subject reported that they had reduced their ecstasy use as a result of this treatment. The major outcome was receiving medical treatment (n=6). Just over half (57%) were satisfied with this treatment.

Six subjects had received First Aid, most of whom (n=5) had reported to the health practitioner that they had taken ecstasy. This type of intervention did not usually lead to reductions in ecstasy use (n=1), most (n=4) only receiving treatment for a negative drug reaction. All subjects were satisfied with the treatment they had received from First Aid staff.

Four subjects had seen a psychiatrist, two of whom were still doing so. Only 2 subjects reported to the psychiatrist that they were using ecstasy. Two subjects reported reductions in ecstasy use. Other outcomes were feeling more psychologically stable (n=2) and increased anxiety and frustration (n=2). Two subjects were satisfied with the treatment, while the other two felt unsatisfied.

Three subjects had seen a drug counsellor, one of whom was still doing so. All presented their problem as ecstasy-related. Outcomes included: receiving support and understanding (n=1), feeling more anxious (n=1), increased knowledge (n=1), and reductions in drug use (n=1). Only one of the three subjects was satisfied with this treatment.

Finally, one subject had attended a detoxification program for an ecstasy problem, for which they only reported increased knowledge as an outcome, and no reductions in ecstasy use. No subjects had attended a therapeutic community or Narcotics Anonymous meeting.

Barriers to seeking treatment among the 17% (n=36) of the sample who wanted treatment but did not successfully obtain it included: denial of their problem or feeling unmotivated (n=24), did not know where to go for help (n=15), inadequate treatment or practitioner (n=14), worried about confidentiality (n=8), lack of time (n=2), and cost issues (n=2).

Table 3: Responses to ecstasy use

	Ever received (n) %	Current intervention %	Presented as ecstasy-related %#	% Reduce ecstasy use#	% Satisfied#*
Formal					
GP	(20) 9	1	80	20	65
Nat. therapies	(15) 7	2	40	27	93
First Aid	(6) 3	-	83	17	100
Casualty	(7) 3	-	100	14	57
Psychiatrist	(4) 2	1	50	50	50
Counsellor	(3) 1	<1	100	33	33
Detox.	(1) <1	0	100	0	100
NA	0	-	-	-	-
TC	0	-	-	-	-
Informal					
Alone	(94) 44	29	-	85	90
Social support	(29) 14	8	95	41	97
Information	(108) 51	-	-	6	52

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

Attempts at modifying ecstasy use without formal assistance were more common among the sample (46%, n=98), with many subjects having done so on their own (44%, n=94) or with support from family or friends (14%, n=29).

Among those who attempted to modify their ecstasy use alone, most (85%) reported a reduction in levels of ecstasy consumption and were moderately to extremely satisfied with the outcome (90%). Additional outcomes reported by these subjects included: having more money (64%), feeling physically healthier (54%), having better concentration (53%), feeling more motivated (50%), improvements in relationships (36%), feeling more psychologically stable (36%) and feeling in control (22%). A quarter (25%) reported negative outcomes such as increased anxiety, frustration and craving.

Among those who were assisted by family and friends, 95% had revealed to them that they used ecstasy. Less than half (41%) were able to reduce their ecstasy use, although most (97%) were generally satisfied with the outcome. Additional outcomes reported by these subjects included: emotional support (76%), better relationships (59%) and increased knowledge about drug use (22%).

Finally, half (51%, n=108) of the sample had received information about ecstasy at

some stage. Among those who had obtained information, few reported any reductions in ecstasy use as a result (7%). The most common outcome was increased knowledge (94%). Just over half (52%) of those who had received information about ecstasy reported being generally satisfied with it. A third (32%) were not at all satisfied, and 16% were only a little satisfied.

Overall, subjects were most likely to report a reduction in ecstasy use from cutting down alone. Half or less had reduced their ecstasy use from the other interventions. They were most satisfied with natural therapies, First Aid, cutting down alone and support from family and friends.

Intervention preferences

Fifty-three percent of the sample (n=112) wanted to make changes to their use of ecstasy. A quarter (29%) wanted to reduce their ecstasy use, 13% wanted cheaper drugs and 12% wanted purer drugs. Minorities wanted to stop using ecstasy (3%), make it more available (3%), increase their ecstasy use (2%) or stop injecting (1%).

Among those who wanted to reduce or stop using ecstasy (n=67, 31%), the most common reasons were: financial problems (61%), physical health problems (49%), work/study problems (40%), psychological problems (39%), to improve their quality of life (28%), relationship problems (16%), because they felt dependent on ecstasy (16%) or because of poor quality drugs (7%).

Fifteen percent (n=33) of the sample wanted formal treatment for an ecstasy problem. The most common request was for natural therapies (9%), followed by consultation with a counsellor (5%), GP (4%) or psychiatrist (1%) or attending NA meetings (<1%).

Most subjects (92%) requested more information about ecstasy, particularly on harm reduction techniques (66%), its side effects (59%) and long-term effects (40%), correct levels of water consumption (35%), its purity (31%), strategies for cutting down (17%), emergency procedures (14%), effects on vital organs (9%) and contraindications (10%). In addition, subjects recommended that information about ecstasy be made more available and accessible (15%), and that drug-testing facilities be provided for users to minimise problems from impurities (70%).

DISCUSSION

Ecstasy-related harms and risk-taking behaviour

Subjects reported a mean of 12.5 physical and psychological health effects from the use of ecstasy in the previous six months. The most common symptoms experienced half or more of subjects were loss of energy, irritability, muscle aches, depression, trouble sleeping, confusion, blurred vision and hot/cold flushes. These were mostly acute symptoms which occurred while using ecstasy and/or while coming off ecstasy. A number of more chronic adverse effects occurring in between use episodes were also reported, including weight loss, depression, loss of energy,

memory lapse, trouble sleeping and irritability. Over half of the sample (57%) reported increases in the side effects from ecstasy since they first used the drug.

While most symptoms were perceived to stem from a combination of ecstasy and other factors (eg. other drug use, continuous dancing, lack of sleep or food), the majority of subjects who reported the following symptoms perceived these effects only to be related to their use of ecstasy: inability to urinate, blurred vision, vomiting, numbness/tingling, flashbacks, confusion and visual hallucinations.

Just under half the sample reported other ecstasy-related problems with work or study (47%), relationships (46%) and finances (47%). Eleven percent were classified as dependent by the Severity of Dependence Scale. Few subjects had experienced legal problems as a result of their ecstasy use (3%), or had a criminal conviction (2%). Comparatively more had been involved in criminal activities (57%), mainly dealing drugs (46%) or property crimes (23%). This level of crime is similar to that reported among samples of regular amphetamine users in Sydney (Hando and Hall, 1997).

Other indicators suggest reasonable levels of functioning in the community; few subjects were unemployed, and most had an established network of close friends. Few (10%) had injected a drug in the month prior to the interview, and of these, only 4 subjects had shared needles, two of whom had cleaned them with bleach.

Fluid consumption while using ecstasy, particularly at dance venues, was of more concern. While most (93%) reported that they usually drank fluids while using ecstasy, not all followed the recommended medical guidelines about levels of water consumption. Half of those subjects who did not break from dancing (52%) and two-thirds of subjects who took breaks (63%) consumed either too little (<250mls per hour) or two much water (up to 1000mls per hour), the former being more common. While several of these subjects also consumed other fluids, such as alcohol (41%), soft drinks (29%), fruit juice (17%), sports drinks (15%) and coffee (4%), some of these may exacerbate the negative effects of ecstasy and are generally not recommended (eg. alcohol and isotonic drinks). More worrying was the finding that half of those who did not drink adequate amounts of water and did not take breaks from dancing consumed no other fluids, and the other half usually consumed alcohol.

Trends since 1990

A comparison of Solowij et al.'s (1992) snowball sample of 100 Sydney ecstasy users recruited in 1990 and the present sample was conducted. The present sample differed in that it contained more females, was younger, more ethnically and residentially diverse and contained a greater proportion of injectors. The present sample were also more frequent ecstasy and other drug users.

Few differences in perceptions of ecstasy-related risks were found between the samples. Both samples rated ecstasy as moderately risky, placing it between cannabis and heroin. Both described short and long term psychological and physical

health problems as key concerns, along with purity issues and dependence. However, significant minorities of the present sample were also concerned about financial problems, legal problems and death.

In terms of the level of ecstasy-related harms, fewer subjects in the earlier sample reported adverse symptoms of depression, paranoia, anxiety, teeth problems and vomiting compared to the most recent sample (exact figures from the earlier sample were not available). Few also reported ecstasy dependence (2% vs 11%), sought professional help for their ecstasy use (1% vs 18%) or modified their ecstasy use alone (1% vs 48%) in the earlier sample. While ecstasy users have not changed their perceptions of ecstasy since 1990, definite trends in ecstasy-related harm and help seeking behaviour appear to have occurred.

Implications for interventions

Somewhat surprising was the considerable proportion of subjects (46%) who had modified their use of ecstasy at some time, either on their own or with support from friends and family. In addition, a substantial minority (18%) had received help from a health practitioner for an ecstasy-related problem, with 5% reporting that they were currently in treatment. The most common treatments were seeing a GP or a natural therapist. Subjects were most likely to report a reduction in ecstasy use when they cut down alone. Half or less had reduced their ecstasy use from the other interventions. They were most satisfied with natural therapies, First Aid, cutting down alone and support from family and friends.

Forty-two percent wanted to reduce or stop using ecstasy, primarily because of financial problems, health and psychological problems and work problems. Fifteen percent were interested in receiving treatment from a health practitioner, the most popular options being natural therapies. Most subjects (92%) requested additional information about ecstasy on harm reduction techniques, side effects, long-term effects, correct levels of water consumption, purity, emergency procedures and strategies for cutting down.

It appears that a substantial minority of ecstasy users do require more formal assistance, and most require further information. Treatment and prevention options need to be developed and tested to meet this demand, given the growing popularity of ecstasy in many developed countries.

Acknowledgments

This research was funded by a grant from the National Initiatives in Drug Education, Commonwealth Department of Health and Family Services. The authors wish to thank Wayne Hall, Nadia Solowij and Stephen Crocker for helpful comments and support throughout the study. A special thanks goes to the many ecstasy users who participated in the study.

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PATTERNS AND CORRELATES OF ANABOLIC-ANDROGENIC STEROID USE

Richard Peters, Jan Copeland and Paul Dillon

INTRODUCTION

Anabolic-androgenic steroids (AAS) are derivatives of the male hormone testosterone and are used in human and veterinary medicine. These drugs exert both anabolic and androgenic effects on the user. The anabolic effects include: stimulation of protein synthesis, particularly in the skeletal muscle; assisting with wound repair; inhibition of urinary nitrogen loss; and the facilitation of bone growth and calcium deposition. The androgenic effects are involved with the development and maintenance of male primary and secondary sex characteristics.

Anabolic-androgenic steroid (AAS) use in Australia is increasing. Results from the 1995 National Drug Strategy Household Survey (Commonwealth of Australia, 1996), suggest a two fold increase in the estimated prevalence of AAS use since 1993. Estimated at 28,800 users nationwide, it is on a par with barbiturate use, and approximately half as prevalent as heroin use. However, this is likely to be a conservative estimation given the degree of under-reporting believed to accompany this form of drug use (Beel, 1996).

User groups

The non-medical use of AAS gained widespread attention due to its use in the sporting arena. However, recent evidence suggests that the use of AAS is not restricted to the sporting elite (eg. Buckley, Yesalis, Friedl, Andersen et al, 1988) and despite being the most visible population of AAS users, it has been hypothesised that they in fact represent the smallest group (Brower, 1989). A larger proportion of AAS users are more concerned with the improvement of physical appearance than with performance enhancement (Buckley et al, 1988). Described as *aesthetes* this group includes competitive and recreational bodybuilders, models and aspiring actors, and those with highly appearance-sensitive lifestyles, such as gay men (Beel, 1996; Shapiro, 1994; Brower, 1989).

The functional use of AAS in order to carry out employment duties has also been reported (Brower, 1989). This group includes bodyguards, security personnel, construction workers, police, firefighters, members of the armed forces and gang members (Beel, 1996; Dart, 1992; and Black, 1991). A further group of AAS users

are adolescents.

User characteristics and motivations

Only limited information about the characteristics of AAS users in Australia and their motivations to use has been published. Our understanding of use in this country is based on extrapolations from overseas research. The few studies that have been conducted here indicate that AAS users in Australia are typically male, reasonably well educated, with most in full-time employment and earning above the general population average (Mugford, 1995; & Plowright, 1993). Motivations to use AAS are typically the improvement of sporting performance in competitive athletes (Plowright, 1993), or the enhancement of physical appearance in non-competitive, recreational AAS users (Beel, 1996; & Mugford, 1995). Pope and Katz (1994) have suggested that a 'reverse anorexia' syndrome may be contributing to the use of AAS. These authors characterise this syndrome as being a "perception that oneself is small and weak, when one is actually large and muscular" (p.406).

Patterns of AAS use

Research into AAS use behaviour has shown that patterns of drug administration vary widely. AAS users will cycle on and off the drugs based on the belief that target receptors shut down after a period of time (World Health Organisation, 1995). The 'on' cycle (referred to as the 'cycle') is where users administer the AAS for a period of time, usually predetermined based on short term goals. The 'off' cycle (referred to as a 'rest period') is a period of no use. The duration of cycles and rest periods vary enormously. Australian based research has found cycles are typically between 8 and 10 weeks and range from 1 to 16 weeks (Beel, 1996; Mugford, 1995; and, Plowright, 1993). However, there are reports of cycles up to 68 weeks in length (Perry, Andersen, & Yates, 1990). Rest periods are generally similar in length to the preceding cycles (Gridley & Hanrahan, 1994). Many AAS users will combine two or more preparations at any given time; a practice referred to as 'stacking'. An average of 3 different AAS preparations were used by male participants in Great Britain (Korkia, 1994) and Australia (Gridley et al, 1994).

AAS users may also administer other drugs to assist with their training. Insulin and human growth hormone are used for perceived muscle building effects (Veggeberg, 1996; Beel, 1996; and Rickert, Pawlak-Morello, Sheppard & Jay, 1992). Amphetamine and ephedrine are used to increase the intensity of training sessions (Beel, 1996). Clenbuterol, thyroxine and diuretics are used to enhance muscle definition by promoting fat loss (Korkia, 1994; Kammerer, 1993; and, Prather, Brown, North & Wilson, 1995). Side effects are 'self-managed' through the use of various drugs. For example, male AAS users may use an oestrogen antagonist to treat and prevent gynecomastia (Friedl & Yesalis, 1989) and human chorionicgonadotrophin to restore spermatogenisis (Korkia, 1994). In addition, a wide range of over-the-counter vitamin, mineral and nutritional supplements are also used.

Consequences

Both positive and negative consequences of AAS use have been reported. Cosmetic benefits reported include improved physical appearance, increased size, and reduced body fat (Lombardo, 1993; and, Yesalis and Bahrke, 1995). Ergogenic benefits are also reported including increased physical strength, injury prevention and a greater level of training intensity (Yesalis et al, 1995; Bahrke, 1993) Psychological improvements include better self esteem and increased approval from others.

The physical side effects associated with AAS use are wide ranging. Adverse effects to physical appearance include acne, premature baldness, hirsutism and gynecomastia (Friedl, 1993; Brower et al, 1991; Kiraly, 1988; and, Brierly, 1987). Testicular shrinkage and decreased spermatogenisis in males, and clitoral hypertrophy, breast shrinkage, and menstrual irregularities in women, are among the adverse effects on the reproductive system (Strauss & Yesalis, 1993; Melchert & Welder, 1995). AAS have also been associated with hepatocellular dysfunction, atherosclerotic heart disease, increased low density lipoprotein cholesterol, increased blood pressure, and the premature closure of epiphyses of long bones in adolescents (Melchert et al, 1995; Brower, Blow, Young & Hill, 1991; Brierly, 1987). Psychological side effects include increased irritability and aggression, regular fluctuations in general mood levels, paranoia, dependence and withdrawal (Corrigan, 1996; Parrot, Choi & Davies, 1994; Brower, 1992; and Moss, Panzak & Tarter, 1992). Injecting AAS users are also at risk of HIV transmission and other blood borne viruses through the unsafe use of injecting equipment (Scott & Scott, 1989).

The aims of the present study were to examine:

1. the characteristics of a sample of AAS users;
2. motivations underlying AAS use;
3. patterns of AAS use; and,
4. the positive and negative consequences experienced.

METHOD

Subjects

A total of 100 anabolic-androgenic steroid (AAS) users were recruited for the present study. Just over one third of the sample were from the inner city of Sydney (38%). The remainder were spread throughout the northern (12%), southern (18%), western (13%) suburbs of Sydney, as well as regional areas throughout NSW (15%). The sample was predominantly male (94%) with only 6 females participating in the study.

The subjects ranged in age from 18 to 50 years with a median of 27 years (mean 29.2 years; SD 6.91).

Sexual Preference and relationship status

Twenty-seven per cent of the sample were homosexual, with a further 3% indicating that they were bisexual. Fifteen percent of the sample were married and had been in their present relationship for 66 months (5.5 years)(SD 59.5 months), 6% were divorced or separated, 22% were cohabiting with their sexual partner, while the remainder (57%) were single. Of the 85 people who were not married, 55.3% were currently in a relationship that had lasted for an average duration of 22.5 months (SD 22.4).

Citizenship and background

The majority of the sample (89%) were Australian citizens. Of the 11 AAS users who were not, 7 were New Zealand citizens, 2 were English, the remaining two being American and Turkish. All of the females were Australian citizens. One male was of Aboriginal or Torres Strait Islander descent.

Education and employment

The mean years of formal education was 14.2 (SD 3.3, range 9-26). More than one third of the sample (35%) had completed or were part way through university education, a further 33% had earned diplomas or trade certificates. Two subjects were currently attending secondary school. The majority of the sample were in full-time employment (73%), and a further 13% in part-time employment. Only 5% of the sample were unemployed with the remainder being students or pensioners. More than one third of the sample (38%) worked in areas of management (company directors, mangers, professionals, para-professionals) and 14% work in the security or fitness industry. Other occupations include salesperson/office clerk (12%), labourer (9%) and tradespersons (8%). Forty-two percent had worked in a job where they believed that physical appearance and/or strength were important for their ongoing employment. This sample also had a substantially higher disposable income than the general Australian community, with only 27% earning less than $30,000 per annum.

Procedure

All subjects were volunteers who were reimbursed for out of pocket expenses. Recruitment took place from September 1996 to May 1997, by means of advertisements in major, local and special interest newspapers in Sydney, and an Australian produced 'muscle' magazine. Advertisements were also posted in gymnasiums, needle exchanges and in retail outlets supplying sporting goods. In addition, recruitment through radio interviews and by word of mouth was also used.

Subjects contacted the researchers by telephone and were screened for eligibility for

the study. To be eligible the subject had to have used anabolic-androgenic steroids in the previous 12 months, or if they had used more than 12 months prior, were planning to recommence in the near future. A meeting time and place was arranged at a location determined by the subject, where either the interview was conducted, or the subject was given the questionnaire for self report. Twenty seven questionnaires were completed by self-report with the remainder being interviewed by one of the research team. Subjects were guaranteed that any information they provided would be kept strictly confidential and anonymous. The interviews took between 45 and 150 minutes to complete.

In both the structured interview and the self-report procedures, standard informed consent procedures were followed. The procedure was approved by the UNSW ethics committee for experimentation involving human subjects.

Structured Interview

A detailed 38-page questionnaire was constructed that examined: demographics; general expectations and the main motivations for using; AAS usage patterns, as well as the use of other ergogenic drugs and side effect treatment/prevention drugs; opinions and attitudes; weight-training activity; sources of AAS; information sources, AAS benefits and side effects, including dependence and withdrawal; recreational drug use behaviour and history; and deterrents. The questionnaire was designed so that it could be used in a structured interview context or by self completion.

Statistical Analyses

The analyses is primarily descriptive in nature. Means, and medians for highly skewed data, are reported for continuous data. Categorical variables are described in percentages. When comparisons were carried out, T-tests are used for comparisons between continuous data and odd ratios (OR) with corresponding 95% confidence intervals (CI) for categorical data. All statistical analysis of the data was carried out using SPSS for Windows.

RESULTS

User groups

Subjects were asked to identify which user group they would classify themselves in. The proportion of subjects classified within each group are as follows: 'competitive bodybuilder' (22%); 'competitive athlete' (11%); 'occupational' (6%); and 'body-image' (61%). The 'body-image' group included all recreational (non-competitive) bodybuilders, and weight trainers. Five of the six female subjects were competitive bodybuilders. The remaining female subject was a competitive athlete. A summary of the sample characteristics, alcohol and drug use history, training activity, and AAS experience by user group is presented in Table 1.

Table 1: Sample Characteristics by User Groups

	Competitive Bodybuilders (n=22)	Competitive Athletes (n=11)	Body-image (*aesthetes*) (n=61)	Occupational (n=6)
Demographics				
Age (yrs)	28.4 (6.64)	30.5 (9.60)	29.3 (6.57)	29.0 (7.21)
Homosexual / bisexual (%)	5	27	39	33
Post school education (%)	73	73	67	50
Full time employment (%)	68	64	80	50
Training				
Weight-training experience (yrs)	6.4 (3.59)	9.8 (6.35)	6.8 (5.22)	6.3 (4.02)
Training before AAS use (yrs)	2.5 (1.45)	4.2 (4.89)	3.7 (4.02)	2.6 (2.62)
Training days per week	5.0 (0.69)	5.0 (1.00)	5.1 (0.93)	4.4 (1.02)
Alcohol & other drug use				
Cigarette smoker (%)	27	14	34	33
Alcohol use: monthly or less	18	27	52	33
never used another drug (%)	41	9	15	0
No. of other drugs tried [a]	1.2 (1.45)	3.1 (2.18)	3.2 (2.38)	4.8 (2.40)
inject any other drug (%)	5	18	16	17
AAS Use				
Age of first use (yrs)	23.1 (5.2)	24.5 (7.85)	25.9 (6.39)	25.0 (5.02)
Duration of regular use (yrs) [b]	4.5 (3.79)	5.73 (2.05)	2.8 (2.95)	3.6 (3.20)

[a] $F(3,93) = 6.31$; $p<.001$
[b] $F(3,93) = 3.52$; $p<.02$

Psychological antecedents to AAS use

Motivations

The subjects were asked to identify the main motivations to use AAS before their first cycle and their last cycle. These motivations are summarised in Table 2 for the total sample and by user group. The main motivation prior to the first cycle for the total sample and for three of the four user groups was to improve appearance. Competitive athletes were the exception, with more motivated by a need to improve sporting performance. Prior to the most recent cycle, more bodybuilders were motivated by

increase size than by general improvements to appearance compared to the first cycle. 'Other' motivations reported by the competitive athletes were 'increased weight' and 'something different' prior to the first cycle, and 'obtain a psychological edge' and 'change muscle quality' prior to the last cycle (each 9%). Body image users also reported 'increase weight', as well as an 'alternative to antidepressants' prior to the last cycle (each 1%).

As indicated in Table 2, fewer subjects reported motivations before their most recent cycle than their first cycle. Subjects who had completed only one cycle were not required to respond. Of the 13 subjects who had completed only the one cycle, two had stopped using AAS. The reasons for ceasing AAS use given by these two subjects were: 'I had only planned to do one cycle'; and, 'I reached my goals'.

Table 2: Main motivations to use AAS

	Bodybuilder (n=22)		Competitive athlete (n=11)		Body-image (n=61)		Occupational (n=6)		**Total sample (N=100)**	
	First	Last	First	Last	First	Last[a]	First	Last[b]	**First**	**Last[c]**
Improve appearance (%)	45	27	9	18	51	49	67	60	**46**	**40**
increase size (%)	36	41	18	9	34	41	33	20	**33**	**36**
increase strength (%)	5	9	18	0	5	4	0	0	**7**	**5**
improve sporting performance (%)	9	18	27	27	3	2	0	0	**6**	**9**
prevent/recover from injury (%)	0	0	9	9	0	2	0	0	**1**	**2**
decrease body fat (%)	0	5	0	0	0	0	0	0	**1**	**1**
other (%)	0	0	18	18	0	2	0	0	**4**	**6**

[a] n=49; [b] n=5; [c] N=87 reflects the number who had started more than 1 cycle

General Expectations

Expectations about the effects of AAS prior to the first and most recent cycles were also discussed. A list of items pertaining to AAS effects was presented with an opportunity to add additional expectations. Table 3 contains this information separately for the four groups and for the total sample. General expectations regarding improvements to appearance and increased size were the most frequently cited across the total sample. This pattern was observed for the competitive bodybuilders, body-image users, and occupational users. Increased strength was also

important to occupational users. More competitive athletes expected increased strength and improved sporting performance than general improvements to appearance. Body image users expected more psychological outcomes than the other groups. This was particularly obvious for improvements to self esteem, approval from others and social benefits.

There is an overall decline in the frequencies for each expectation from the first to the most recent cycle. Notable exceptions include increases in improved appearance and injury prevention in the competitive athletes. A considerable reduction in improved sporting performance was also observed in this group.

Table 3: Expectations of AAS use

Expectation	Competitive Bodybuilder (n=22)		Competitive Athlete (n=11)		Body image (*aesthetes*) (n=61)		Occupational (n=6)		Total Sample N=100)	
Physical	**First**	**Recent**	**First**	**Recent**	**First**	**Recent[a]**	**First**	**Recent[b]**	**First**	**Recent[c]**
improve appearance (%)	77	68	45	82	90	82	100	80	83	75
increase size (%)	82	77	73	45	84	80	100	80	83	78
increase strength (%)	55	59	82	55	62	47	100	80	65	53
train harder (%)	41	50	64	64	51	43	67	40	51	47
decrease body fat (%)	41	55	27	45	33	45	83	20	37	46
increase energy level (%)	23	27	45	45	20	24	67	0	26	26
prevent injury (%)	23	36	36	64	21	24	33	40	24	33
improve sporting performance (%)	18	27	73	45	16	16	17	20	23	24
Psychological	**First**	**Recent**	**First**	**Recent**	**First**	**Recent**	**First**	**Recent**	**First**	**Recent**
reach personal goals (%)	59	64	64	64	41	39	50	40	48	48
improve self esteem (%)	27	18	0	27	49	39	67	60	40	33
attract partners (%)	14	5	18	27	44	29	17	40	33	23
competitors use (%)	36	45	27	18	13	10	0	0	19	17
social benefits (%)	14	9	9	0	25	27	0	0	19	10
increase approval (%)	5	5	9	9	21	14	17	0	17	20
euphoria (%)	0	5	0	18	11	16	17	0	8	13
improve job function (%)	0	0	9	9	3	8	67	60	7	9

[a] n=49 [b] n=5 [c] N=87 reflects the number who had started more than 1 cycle

Body image perceptions

Nearly half of the sample perceived their physical attractiveness (49%) and their overall attractiveness (48%) was either 'well above average' or 'above average'. Thirty four percent of the sample believed their physical appearance, and 45% their overall appearance, was 'average'. Few subjects believed that their physical (4%) or overall

appearance (2%) was 'below average'. When asked to describe their own build, more than half (57%) believed it was 'about right'. Twenty nine percent thought they were 'too small', while 7% said they were 'too big'. The remainder were not able to say.

Subjective strength ratings indicated that few subjects (2%) perceived their strength to be 'below average'. The majority (71%) indicated their strength was 'well above average' or 'above average', with the remainder (27%) being 'average'.

Nearly half of the sample (49%) said that they were not satisfied with their body shape. Twenty-two of these subjects had described their build as being too small. However, very few considered their overall appearance (4/22) or their physical appearance (2/22) was below average. Only 1 of these subjects indicated that he had below average strength.

Patterns of anabolic-androgenic steroid use

The average age at first use of AAS was 25.1 years (SD 6.3) ranging from 14 to 46 years. Regular use of AAS commenced typically one year after their first use (mean 25.9; SD 6.3), ranging from 17 to 46 years. Overall the sample had been using for a mean of 4.2 years (SD 3.6), ranging from less than one month to 21 years. The number of years of regular use ranged from less than one month to 16 years, with a mean of 3.6 years (SD 3.2). At the time of study participation, 38% were, on average, half way through a cycle (SD .21). For the remaining 62%, the median number of weeks since their last cycle was 12 weeks, ranging from 1 to 156 weeks (mean 28.3; SD 36.1).

Monitoring of use

More than half of the sample (54%) were being monitored, of which the majority were being monitored by a doctor (59.3%), followed by a friend (25.9%), trainer (7.4%), medical student (3.7%), wife and self monitored (1.9% each). Most of these subjects were being monitored from the start of their first cycle (80.8%), 13.3% from some point within the first cycle; the remainder (5.9%) had their AAS use monitored from the second course.

Sources of AAS

The majority of the sample (64%) believed that it was either 'easy' or 'very easy' to obtain the AAS that they wished to use. One quarter of the sample believed that it was either 'difficult' or 'very difficult', while the 11% remaining were not able to say. Subjects were asked to indicate where they usually and had ever obtained their AAS, summarised in Table 4. The sources of AAS are not just restricted to friends and dealers, with some users accessing the distributors directly.

For many (57%), the suppliers' stock of AAS dictated which AAS they would use, although more than half of the sample (57%) had more than one type of regular supplier (eg. friend, dealer). Just under one third of the sample (31%) indicated that

their relationship was purely a business interaction, paralleled by 32% who said that there was not a high degree of trust between themselves and their regular supplier(s).

Almost half of the sample (44%) had seen, and 21% had used, what they believed to be fake AAS. The reasons given for identifying particular AAS as being fake include 'poor labelling and packaging', 'incorrect appearance [and/or texture] of the AAS', 'didn't have the desired effect' and was 'too cheap'. Of the sample who had used fake AAS, the majority experienced no side effects (72.7%); the remainder experienced increased acne and 'viral' symptoms including fever, stomach pains, nausea, vomiting and headaches.

Table 4: Sources of AAS

Source	Ever Obtained (% of sample)	General Supplier(s) (% of sample)
Friend	64	54
Doctor*	42	21
Pharmacist*	18	8
Dealer	41	32
Gym employee	14	9
Coach/trainer	14	10
Vet	11	6
Relative	6	4
Mail Order	4	3
Vet supplier	1	1
Fake prescription	1	-
Horse trainer	1	-
Brought in from overseas	1	-

* legal and illegal procurement not distinguished

Injecting Issues

Only 3 participants in the study had never injected AAS. The majority of those who had injected (83%) did so from the commencement of their AAS use history; 8.8% commenced injecting within the first year of use, 6% within 2 years, while the remainder commenced injecting between 3 and 14 years since first AAS use.

Table 5 summarises the sample's introduction to injecting and current injecting practices. While many preferred to have someone else inject them on their first administration of AAS, there is an obvious shift to self injection. Another interesting

feature of this data is the number of subjects who taught themselves how to inject, using information provided in sources such as steroid handbooks, instructional videos and medical literature. Figure 1 shows injecting sites, with the most common sites being the buttocks and the shoulders/deltoids. Forty-five percent of the sample are regularly injecting into more than one place, up to a maximum of 6 different injection sites. Nearly half are (49%) injecting into the buttocks only, 4% only in the thigh muscle, and 2% only in the shoulder. Just on two-thirds injected on their own (65%).

With regard to safe injecting practices, there was only one instance of re-use of someone else's needle or syringe after they had used it; this did not occur in the 12 months preceding the interview. Four subjects reported someone else using the needle or syringe after they had used it, two of which occurred more than 12 months ago, one 11 months before the interview and the other 4 weeks prior. Four subjects reported re-using their own needles and syringes in the last month, two of which did not attempt to clean them before re-use. The small number of people engaging in risky injecting practices is reflected in the large majority of those injecting who have no problems getting clean needles and syringes (92%).

Table 5: Persons involved in injecting of AAS

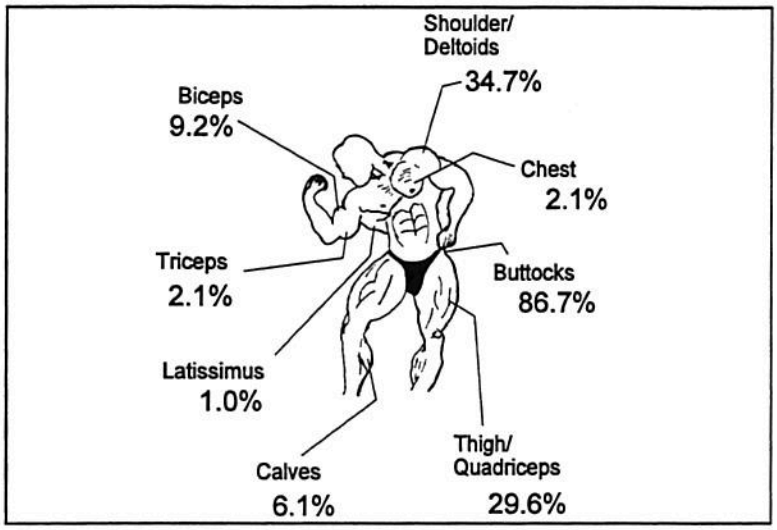
Person	First injection	Current	Who showed you how to inject?
Friend	37	14	29
Doctor	24	5	30
Self	23	65	13*
Coach/trainer	7	1	6
Partner	2	3	1
Dealer	1	0	1
Med. Student	2	0	0
Brother\relative	1	0	3
Training partner	2	1	1
Gym employee	1	0	0
Nurse (friend)	0	2	2
(No longer use)	-	9	-
Never personally injected	-	-	14

* self taught from steroid handbooks and other steroid information sources

Cycle information

The median total number of AAS cycles per person was 7 (mean 8.5; SD 8.9) ranging from 1 to 60. The average number of cycles in the last 12 months was 2.1 (SD 1.5). The usual length of their cycles was around 10 weeks (mean 9.8; SD 5.3), ranging from 3 to 52 weeks, with the average rest period between consecutive cycles being 12 weeks (mean 11.7; SD 9.7); the rest periods ranged from less than 1 week to 1 year. Fifty-two weeks was the longest reported cycle by anyone at any time in their AAS use history.

Figure 1: Injecting sites (% of sample)



Two-thirds of the sample were using a combination of human and veterinary AAS preparations, 20% using veterinary only and 13% human only. Eight-two percent of the sample had ever used human AAS, while 90% had used veterinary products. The subjects were asked to indicate which AAS preparations they had ever tried. A total of 22 human and 38 veterinary preparations were reported by at least two subjects. The most commonly used are reported in Table 6. 'Deca-durabolin' (*nandrolone decanoate*) and 'Sustanon 250' (*testosterone propionate, testosterone phenylpropionate, testosterone isocaproate, and testosterone decanoate* mix) were the most commonly used human AAS, both of which are injectable preparations; 'Anapolan 50' (*oxymetholone*) and 'Primobolan tablets' (*methenolone acetate*) were the most commonly used oral preparations. The most commonly used veterinary AAS, both of which are injectable preparations, were 'Stanazol' (*stanazolol*) and 'Deca 50' (*nandrolone decanoate*).

Nearly half of the sample (49%) used at least one other drug as part of their cycle. The five drugs most commonly used by this sample were for the prevention, or treatment, of side effects. These drugs are given in table 7. The use of over-the-counter nutritional supplements were used by 80% of the sample. Protein powders (57%), multivitamins (52%), Vitamin C (44%), Vitamin B (36%), energy drinks (36%), and creatine monohydrate (30%) were the most commonly used.

Table 6: AAS preparations ever used

Trade Name	Composition	%
Human		
Deca-durabolin	*nandrolone decanoate*	68
Sustanon 250	mix: *testosterone propionate* *testosterone phenylpropionate* *testosterone isocaproate* *testosterone decanoate*	64
Anapolan 50	*oxymetholone*	49
Primobolan tablets	*methenolone acetate*	38
Andriol	*testosterone undecanoate*	23
Primobolan depot	*methenolone enanthate*	22
Veterinary		
Stanazol	*stanazolol*	74
Deca 50	*nandrolone undecanoate*	56
Supertest	*testosterone propionate*	52
Dynabol 50	*nandrolone cypionate*	45
Drive	mix: *boldenone undecylenate* *methandriol dipropionate*	44
Testo La	*testosterone cyclopentylpropionate*	30
Spectriol	mix: *methandriol dipropionate* *nandrolone phenylpropionate* *testosterone enanthate* *testosterone hexahydrobenzoate* *testosterone propionate* *testosterone cypionate*	25
Cooper's Banrot	*testosterone cypionate*	22

A series of open ended questions were asked regarding the typical cycle of each subject, detailing the AAS preparations used and the amount and timing of each administration. Four subjects described their typical cycle in general terms while 2 subjects declined to give any information.

The typical cycles described by these 94 users ranged from 3 to 52 weeks in duration, with an average length of 9-10 weeks (mean 9.6; SD 5.3). Within the cycle, an

average of 2.5 different AAS preparations were used; 31% used just the one, 34%

Table 7: Drugs used in conjunction with AAS

Drug	% of sample	Drug	% of sample
proviron	23	thyroxine (T4)	8
oestrogen antagonist	19	amphetamine	6
clenbuterol	14	insulin	4
diuretics	12	beta blockers	3
hCG (human Chorionicgonadotrophin)	11	antibiotics	2
ephedrine	11	pregnyl	2
human growth hormone	9	daonil	2

used two, 22% used three or four, 10% used five or six, and 3% used seven or eight. The majority of the sample (73%) do not usually use an oral AAS; 19% used only one, with the remainder (7%) using either two or three. Nearly two thirds of the sample are using either one (30%) or two (35%) injectables, 23% use either three or four, 6% five to seven, with only 5% not usually using injectable AAS.

Benefits

The subjects were asked to nominate the most important benefit from AAS use that they had experienced. In addition, they were required to identify from a list provided which benefits they experience and how often. These results are given in Table 8.

Psychological Side Effects

More than half of the sample indicated that they experienced mood swings (54%) and increased irritability (54%). A further 28% said that they were more impulsive, 21% experienced depression, and 12% increased paranoia. Forty two percent indicated their behaviour was more aggressive, 47% the same and 3% were unsure. Of those who described their behaviour as more aggressive, a number of explanations were offered including 'lose patience easier' and 'lose temper easier' (each 23.5%), 'more easily irritated' (17.6%), 'agitated more easily' (5.9%), and 'more sensitive', 'more scared', 'more assertive', 'more outspoken', 'uptight', 'more likely to argue', 'greater belief in yourself', 'less tolerant', and 'more likely to resort to violence' (each 2.9%).

When asked whether their friends or family have been affected by their AAS use, 30% indicated that they had, of which 73% said that their relationships had worsened; they attributed this to, for example, 'being less tolerant' (17%), 'unable to deal with small issues' (13%), 'increased pressure' and 'not communicating' (8%). Other explanations

were 'poor conflict resolution skills', and 'too dedicated to training

Table 8: Benefits from AAS use

Benefit	most important benefit[a] (one only)	always	often	sometimes	rarely or never
improve appearance	37	61	31	6	2
increase size	37	66	25	7	2
increase strength	7	67	18	9	6
improved self esteem	5	36	29	19	16
decreased body fat	4	18	25	38	19
improved sporting performance	3	28	2	20	30
increased approval from others	4	16	18	30	36
increase sex drive	-	48	22	19	21
increase energy levels	-	36	31	18	13
able to train harder/longer	-	53	31	9	7
prevent/recover from injury	-	34	25	15	26

[a] 3% were not able to identify the most important benefit

routine'. A similar question directed at work relationships revealed that only 13% believed that AAS had had an effect, of which only 46.7% believed that it had worsened. 'Impatience', 'aggressiveness' and 'mood swings' being the main explanations for worsening work relationships. 'Greater confidence' and 'lower stress levels' were offered as explanations for work relationships that had improved.

Questions keyed to the DSM-IV criteria for substance use disorders were examined as a means for screening for dependence and abuse. The number of positive responses were added together as a means of assessing the likelihood of AAS dependence within the sample. Twenty percent of the sample answered 'yes' to three or more of the questions. One of the female subjects was found to be dependent. The full Composite International Diagnostic Interview (CIDI) Core Version 2.0, substance related disorders module (provides DSM-IV diagnoses of substance abuse/dependence), the Severity of Dependence Scale[49] modified for AAS, and the Ontario Adult Drug Use Questionnaire (operationalises ICD-10 dependence) all indicated a diagnoses of dependence for this female subject. One quarter of the sample also met the criteria for substance abuse.

Symptoms of withdrawal following the cessation of a cycle were also examined. Many of the withdrawal symptoms reported were psychologically based including 'dissatisfaction with body image' (38%), 'depression' (31%), 'desire for more' (28%),

'lack of interest' (23%), 'anxiety' (12%) and 'restlessness' (10%). Only two subjects had suicidal thoughts after cessation. Physical withdrawal was experienced as loss of appetite (33%), headaches (6%) and nausea (2%).

Physical side effects

A description of the physical side effects experienced by the sample is given in table 9. One fifth of the total sample believed that they had permanent side effects from AAS use, involving gynecomastia (5%), voice changes (4%), acne scars and hair loss (3% each), metabolic changes, clitoral enlargement, testicular shrinkage, stretch marks, and put on fat easier (each 1%%). In addition, 21% believed that they had experienced side effects bad enough to stop, although this usually resulted in the discontinued use of only certain preparations.

Just on two thirds of the sample (66%) were concerned about the side effects of AAS. A large proportion of these people (75%) were concerned about general health issues (eg. heart, liver, and cardiovascular function), 56% concerned about deleterious effects on their reproductive functioning, 48% concerned about general appearance (eg. acne, hair loss), 30% effects on family, 27% mood changes, 22% legal concerns, 19% increased aggression, and 1.5% each on the financial drain it causes, and immune system suppression.

Deterrents

Nearly three quarters of the sample (73%) believed that the benefits outweighed the side effects, 10% did not, while the remainder (17%) were not able to say at the time. We examined a number of deterrents to using AAS asking subjects to choose one of five response categories. These are summarised in Table 10. The most likely deterrents were 'general ill health' and 'steroid side effects' rather than legal deterrents.

Table 10: Deterrents to AAS use

Deterrent	'Extremely Likely' or 'Likely'	'Don't Know'[a]
general ill health	81	10
AAS side effects	68	15
new information on dangers	47	32
cost doubling	29	17
greater police attention	23	17
increased criminal penalties	21	15
lack of public acceptance	10	14

[a] other response categories were 'unlikely' and 'extremely unlikely'

Table 9: Physical Side effects reported

Effects[a]	% of sample	Effects	% of sample
increased appetite	85	**WOMEN ONLY**	**(N=6)**
increased sex drive	84	clitoral enlargement	100
water retention	64	facial hair	83
sore injection sites	57	menstrual irregularities	67
acne	54	smaller breasts	67
increased body hair	48	**MEN ONLY**	**(N=94)**
sleeplessness	43	shrinking testicles	55
headaches	28	gynecomastia	34
high BP	18	painful erections	15
more frequent colds	17	impotence	4
decreased appetite	17	problems with reproductive function	4
tendon injuries	16	prostate problems	3
voice changes	16		
nose bleeds	14		
bum sores	13		
hair loss	10		
liver problems	10		
kidney problems	3		
lymph node swelling	3		
heart problems	2		

[a] medical clarification was not sought or discussed

DISCUSSION

Sample Characteristics

The AAS users involved in the present study are an older sample of illicit drug users, using AAS for the first time in their mid-twenties. This is consistent with other Australian based studies (Beel, 1996; Mugford, 1995; and, Plowright, 1993) but contrasts overseas findings where first use occurs typically at age 18 (Yesalis, Kennedy, Kopstein & Bahrke, 1993). Although there are a number of anecdotal reports suggesting that adolescent AAS use is increasing, the general population of

AAS users in Australia is typically older. Use among the gay community has been identified in this study as being of considerable size, with almost one third of respondents preferring same sex partners.

This sample of AAS users is more likely to be male, well educated and in full or part-time work than other groups of illicit drug users recently studied in Australia (Darke, Ross, & Hall, 1996; and, Topp & Darke, 1997). They also had a substantially higher disposable income then the general Australian community. In addition, unlike other illicit drug using groups, they are also engaged in rigorous training routines directly related to their primary drug use. Ninety-four percent of the sample were training at least 4 times per week, with only one not actively involved in training. Recreational drug use by this sample was also low in comparison to other illicit drug using populations (Swift, Hall, & Copeland, 1997; and, Darke & Hall, 1995). The homosexual subjects were largely responsible for the level of poly drug use by this sample. Future examination of polydrug use by AAS users should therefore investigate differences based on sexual preference.

User Groups

Delineation of AAS user groups in the past has identified four categories: athletes; *aesthetes*; occupational; and, adolescents. Using this format competitive bodybuilders have been grouped with recreational bodybuilders and weight trainers and labelled as *aesthetes* (Shapiro, 1994; Gridley et al, 1994; and, Brower, 1989). Differences between these types of users found in the present study suggest a need to separate the two. In the present study we have referred to the non-competitive *aesthetes* as 'Body image' users. Consistent with overseas reports (eg. Shapiro, 1994) this subgroup still accounted for the majority of AAS use. The high proportion of non-competitive AAS users found in this and another Australian based study (Beel, 1996) highlights the need to focus considerable attention to this group rather than the use of AAS for performance enhancement in sport.

The incidence of AAS for occupational benefits was low. All of these subjects knew of other members of their profession who used AAS, although, we cannot speculate as to their motivations. From the six subjects who were in this group, we have identified security personnel, fitness consultants and actors as occupations where AAS use may be perceived by some to be beneficial.

Psychological Antecedents

Speculation about the possibility of a reverse anorexia syndrome as described by Pope et al (1994) was not supported by the present study. An individual with this disorder would have a low physical self-image, such as a perception of being small and weak despite the opposite physical appearance. A number of findings from the present study do not suggest such a state of mind. Of the 29% who believed they were too small, only one also indicated that they were of below average strength. In addition, very few reported being below average in physical (4%) or overall (2%) attractiveness. Despite some evidence of dissatisfaction with current body shape, it is

unlikely that poor physical self image is responsible for AAS use among this sample. Plowright (1993) concluded that the competitive environment in which AAS users spend much of their time is a greater contributing factor. Given the large majority of non-competitive users in this sample, other factors may also be involved particularly relating to social forces.

The present study has shown the need to examine general expectations in addition to main motivations. The main motivations reported by the sample were predominantly physical and fairly consistent across users. The majority were using to improve appearance (46%) or increase size (33%). This pattern was observed within 3 of the 4 sub-groups. More competitive athletes were motivated by the need to improve sporting performance than appearance. However, an examination of general expectations indicates a greater propensity for psychological expectations by the Body image users than the other groups. Enhanced self esteem, increased approval from others and general social benefits were more commonly reported by this group than either the competitive bodybuilders or athletes. While the main motivations for using AAS were physical in nature this examination of the general expectations highlights the greater need for psychological benefits for those users who are not competitive. This is further reason to separate the competitive bodybuilders from the *aesthetes*.

Patterns of Use

Supply

Although we did not address the issue of AAS supply, the results suggest a supply network among friends and acquaintances without describing the primary source. While some participants did identify a primary supplier (vet, horse trainer), most of the sources were secondary.

Of growing concern regarding AAS supply is the issue of counterfeit AAS. In fact this is a major reason that the participants believed in a change in the current prescription laws. If laws are to remain unchanged then counterfeit AAS are going to continue to be a problem, particularly for the inexperienced user, and those using in isolation. Although anecdotes suggest that the negative consequences of counterfeit AAS use are limited, there must still be a serious concern about their apparently increasing production.

Injecting

Injecting practices of the present sample, for the most part, are not conducive to the transmission of HIV and other blood borne viruses. While there were reported cases of needle sharing, and needle reuse, the overall figures compare to that of Plowright (1993). Plowright suggested that the low incidence of needle sharing is due to the fact that AAS injecting is not a social one. Although this is probably an important factor, the present study indicates that it is not the sole reason, with only 65% of users in the present sample injecting alone. An additional hypotheses would be that the education

strategies regarding safe injecting practices and the provision of needle exchanges that are in place within NSW and the ACT are having the desired effect.

Another issue regarding injecting practices is the high incidence of specific site injections, such as those directly into the biceps and calf muscles. While many believe in the efficacy of specific site injections in addition to the recommended safe sites of the buttocks, or outer thigh, very little research attention has been payed to this practice. The present study has indicated that it is a common practice and is certainly worth further research.

Cycle Information

As can be seen from the discussion of specific patterns of use, a great deal of variation exists among the AAS users regarding their patterns of use. Although there are similarities in the specific preparations used, the way in which they are used can vary dramatically: in the duration of use; amount administered each week; and other AAS used in combination. However, many of the AAS users who participated in this study do not simply administer the drug, go to the gym and wait for the benefits. In most cases there is often a thoroughly planned routine by which they will administer AAS, conduct their training sessions and control their diet.

Adding to the complicated nature of AAS administration, is the use of other drugs for the management of side effects and to assist with training. Many of these drugs have a number of risks attached to their use in isolation such as, diuretics and clenbuterol. The self-treatment of AAS side effects has been reported in other studies. For example, Friedl et al (1989) examined the self-treatment of AAS induced gynecomastia in four male users, concluding that neither an oestrogen inhibitor (antagonist), *mesterolone* (proviron) or human chorionic gonadotrophin (hCG) were successful treatments for this condition. In the present study, however, an oestrogen antagonist (*tamoxifen*) was the only drug used for specifically this purpose, by 19% of the sample.

With many users reportedly using multiple AAS preparations, other drugs for training or side effects, and nutritional supplements, there are a number of possible adverse interactions between them for which the user can not prepare.

Benefits

Unlike many other illicit drugs (eg. marijuana, amphetamines), where the reported benefits are mainly psychological, and directly attributable to the drug effect; the same can not be said for the psychological benefits of AAS. The most important benefits reported here being physical, namely, increased size and improved appearance. However this is not to say that psychological effects directly attributable to AAS are not possible. Mood swings and increased irritability are experienced by more than half of the sample, whose manifestations may indeed be attributable to the drug effect. Nevertheless, the more commonly reported psychological effects, such as increased motivation and confidence, are likely to be secondary to physical improvements.

Psychological effects

One of the more highly publicised psychological or behavioural effects of AAS is increased aggression. In other studies investigating changes in aggression levels, contrasting results have been found when assessed on various psychometric measures (eg. Yates et al, 1992; and Bahrke, Yesalis & Wright, 1990). In suggesting reasons for this disagreement, Yates et al point to the enormous variability that is seen in the individuals who have participated in the respective studies.

Nearly half of the participants in the present study indicated that their behaviour is more aggressive while using AAS. Based on personal experiences described by these subjects, AAS may be placing users closer to the point of aggression, thus taking less irritation or provocation. Although it is likely that some users do, and will always, abuse this greater propensity towards aggression, it is possible that such behavioural effects could be reduced through greater awareness of what is happening and the knowledge to be able to deal with it.

In support of this hypothesis, a series of controlled investigations involving non-human primates (a breed of macuaqe) suggests that the "mechanisms underlying changes with AAS is not purely pharmacologic; it involves the interactive effect of the drug, personality and social factors (See Gregg and Rejeski, 1990).

Dependence and withdrawal

A number of studies have examined the issue of dependence using the criteria set by the American Psychiatric Association (1994) in *The Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV). The present study also used this criteria, identifying 20 subjects who met the requirements for dependence. In contrast, in a study of 49 AAS users recruited from gymnasiums in Michigan, U.S., 57% met the requirements dependence (Brower et al, 1991). This variability between studies employing the similar assessment criteria highlights the need for further research into AAS dependence. The identification of a dependent female AAS user in the present study has challenged previous beliefs about the AAS dependence syndrome being male specific (see Brower et al, 1991).

Associated with dependence is the manifestation of withdrawal symptoms following cessation of use. The present study identified a number of symptoms that were mainly psychological, possibly reflecting a self-perceived reversal of some of the physical effects of AAS (ie. reduced size); a dissatisfaction with the body image, desire for more AAS and depression are examples of this kind. These findings highlight the importance and need for adequate psychological awareness, on the part of the user, to prepare and deal with many of the withdrawal symptoms of AAS use.

Physical side effects

While physical side effects are experienced across the board, many of them are not reportedly experiencing serious problems. The low incidence of heart, liver, and

kidney problems reported may be due to the fact that they require medical testing to identify. With just on 30% being monitored by a doctor, it is quite possible that these problems do exist in many without the individual knowing about it, unfortunately, this study did not identify those who had had the relevant tests and so we must practice caution in extrapolating these results. In addition, many of the pathology tests that are conducted are not necessarily able to identify problems, with more expensive procedures necessary (eg. Magnetic Resonance Imaging) (Sullivan, personal communication).

Regardless of the accuracy of self-reported symptoms of AAS use, the sample did indicate that the most likely deterrents to using AAS were health related, either from specific side effects or general ill health. With this in mind, there is the suggestion that they are not experiencing the side effects at a point that is causing them concern. Many are willing to stop as soon as they do, when or if that may be the case. Of the sample that had indicated that they were not planning to use again, most of the reasons offered were due to a shift in priorities or ethical standpoint, retirement or lack of interest, and not because of the negative side effects experienced. This certainly has implications for education strategies where a concentration on the negative side effects is used.

Intervention Opportunities

The present sample's view on likely deterrents to AAS use has implications for the development of preventative strategies. In accordance with previous research (Moss, Panzak, & Tarter, 1992), this sample is unlikely to be deterred from AAS use because of greater penalties or increased police attention. Moss et al (1992) suggest that education initiatives that highlight the legal ramifications are therefore unlikely to be successful as a preventative tool. However, there was some indication from this group that the presentation of new information, or that which the individual was not previously aware of, may facilitate abstinence. Relevant information should therefore be made available and continually updated.

The manner in which this information is presented is likely to be as crucial as the information itself. Simply informing the individual that they may experience a particular side effect is not sufficient to prevent use. These users are waiting for the problem to arise before modifying their AAS use. Strategies for prevention must consider this in view of the importance many users place on the perceived benefits. Their resistance to changes in cost is a further example of this phenomenon.

AAS use may becoming more popular and it is likely to continue in view of the current value system that is in place in society (Yesalis & Bahrke, 1995). The present study has provided further support for the claim that non-competitive recreational users make up a large proportion of the AAS using population. While physical improvements are the main motivating forces, this group is also more likely to expect psychological benefits. Education strategies that understand these needs, identifies specific requirements and provides non-pharmacologic alternatives to obtain them, may help to reduce the number of users in this group.

Overview of harms

The present study has identified a number of areas of concern for the AAS using population. These can be summarised as follows:

- the illegality of use and the consequences of criminal records on career and future job prospects;
- self taught injecting methods;
- specific site injections for localised muscle growth;
- the 'stacking' of a number of AAS in any given cycle;
- concurrent use of other drugs for ergogenic reasons or for side effect treatment or prevention;
- concurrent use of recreational drugs;
- the 'unknown' component and possible dangers of counterfeit AAS; and,
- the possibility of a wide range of physical side effects and psychological effects including aggression and dependence.

Future research initiatives will need to examine adolescent and female AAS use. Owing to the absence of adolescent users in the present sample, and in view of anecdotal information, adolescent AAS use needs to be investigated. Similarly, the proportion of female AAS users in the present study may not accurately reflect the extent of use by females. The identification of a female dependent AAS user in the present study is further reason to focus more attention on this group.

Further research activities could include: a close investigation of the patterns and correlates of aggression associated with AAS use; an evaluation of the effectiveness of harm reduction activities by general practitioners, examining best practice and legal and ethical obligations and implications; and, clarification of the AAS dependence syndrome.

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CANNABIS USE AMONGST YOUTH

Michael T Lynskey

INTRODUCTION

Cannabis is the most widely used illicit drug in Australia and in many other countries, including New Zealand, the United States and Britain. In general, first use of cannabis typically first occurs during adolescence and continues into young adulthood but declines at around age 30 years (Chen & Kandel, 1995). Given the widespread use of this drug and concerns about potential deleterious health and social effects of its use, there has been ongoing interest in researching the prevalence, aetiology and consequences of adolescent cannabis use. Longitudinal research methodologies have been recognised as the optimal method for studying the development of substance use (Kandel, 1980) and one such study, the Christchurch Health and Development Study (CHDS) is being conducted in Christchurch, New Zealand. An important component of the recent phases of this research has involved the study of substance use behaviours, including tobacco, alcohol and illicit drug use, with the principal illicit drug used by New Zealand adolescents being cannabis.

The aims of this paper are to summarise research into cannabis use in New Zealand using data collected during the course of the Christchurch Health and Development Study, a longitudinal study of a birth cohort of 1265 Christchurch born children who have been studied to the age of 18 years. The specific aims of this paper are to:

1. Provide a brief introduction and summary of the Christchurch Health and Development Study.

2. Describe the prevalence of cannabis use amongst members of the CHDS cohort during the interval from 14 to 18 years of age.

3. Compare rates of cannabis use amongst the CHDS cohort with estimates of the prevalence of cannabis use amongst Australian youth using data collected as part of the 1995 National Household Survey.4. Summarise and discuss research findings on the short term consequences of adolescent cannabis use.

The Christchurch Health and Development Study

The Christchurch Health and development study is a longitudinal study of a birth cohort of 1265 Christchurch (New Zealand) born children who have been studied at birth, four months, one year and annual intervals to the age of 16 years and again at age 18 years. Data has been collected from a variety of sources including parental

interval (birth to 16 years), child interval (8 to 18 years), teacher report (6 to 13 years), official sources of information including hospital (birth to 18 years) and police records (14 to 18 years) and interviews with a "significant other" nominated by the respondent at age 18 years. Information has been collected on a wide range of topics including physical health, utilisation of health services, family living circumstances, educational attainment, early school behaviour, criminal offending, mental health and substance use. A detailed account of the methodology of this study and early research findings has been provided by Fergusson, Horwood, Shannon and Lawton (1989).

The Prevalence of Cannabis Use in New Zealand

At age 14 years sample members were asked whether they had ever used cannabis and, if so, they were asked a series of further questions concerning their use of cannabis including their frequency of cannabis use and the circumstances in which they used the drug. In subsequent interviews they were asked whether they had used cannabis during the preceding year (or, in the case of the 18 year interview, whether they had used it during the preceding two years). On the basis of this information it was possible to estimate the percentages of the sample who had ever used cannabis by any given age and the results of this analysis are summarised in Table 1. The results in this Table show that, not surprisingly, there was a rapid increase in the rate of initiation to cannabis use over the interval from 14 to 18 years. At age 14 only 3% of the sample reported having used cannabis but this had risen to 50% of the sample by age 18 years. The Table also shows no apparent gender differences in rates of cannabis use within the sample.

Table 1: Estimated cumulative percentages of males, females and the total CHDS cohort who had ever used cannabis by a given age

Age	Males	Females	Total Sample
14 Years	2.9	3.1	3.0
15 Years	9.6	10.2	9.9
16 Years	21.2	20.9	21.1
17 Years	43.3	40.6	41.9
18 Years	51.7	48.3	50.0

While the results in Table 1 give a good indication of the percentages of the cohort who had ever tried cannabis, they give no indication of the extent and frequency of cannabis use. This issue is explored in more detail in Table 2 which shows the percentages of the cohort who reported using cannabis on a weekly basis or more often during the interval from 14 to 18 years. The results in this Table show that, while 50% of the sample reported using cannabis at age 18 years, the majority of those who were using cannabis were using the drug only infrequently: approximately 22% of the cohort, or 45% of those who reported cannabis use, reported that they had used the drug on only one or two occasions during the preceding year. There was, however, a small minority (10%) who reported using cannabis on at least a weekly basis. Additionally, in contrast to the results

summarised in Table 1, there was evidence to suggest gender differences in the prevalence of frequent cannabis use. In particular, while approximately equal numbers of males and females reported having used cannabis in the 12 months before their 18th birthday, more males than females reported weekly or daily use of cannabis.

Table 2: Frequency of cannabis use amongst males, females and the total CHDS cohort at age 18 years

Frequency of Use	Males (n=505)	Females (n=520)	Total (n=1025)
Daily	6.7	2.5	4.6
At Least Once/ Week	8.7	3.3	6.0
At Least Once/ Month	5.4	6.7	6.1
Less Than Once/ Month	8.9	10.2	9.6
Only Smoked Once or Twice since 16	20.4	22.7	21.6
Not Currently Using	50.0	54.6	52.3

Australia and New Zealand Compared

To the extent that Australia and New Zealand share a number of broad cultural similarities it is of interest to compare rates of cannabis use in the two countries. Such comparisons should, however, be treated with caution due to the lack of comparable data. Keeping this caveat in mind, Table 3 shows, for both Australia and New Zealand the percentages of young people who reported having used cannabis and the percentage who reported using it on at least a weekly basis, at ages 14 through 18. The New Zealand data is derived from the Christchurch Health and Development Study, described above, and data for Australia is based on the 1995 National Drug Strategy Household Survey (Commonwealth Department of Health and Family Services, 1996). This survey, which is funded by the Commonwealth Department of Health and Family Services and conducted at regular intervals, interviewed a total of 3850 individuals from throughout Australia in 1995. The data presented here is based on unweighted data collected from respondents aged 14-18 years and there was a total of approximately 60 respondents in each of these age groups.

The results in Table 3 suggest the following general conclusions. Firstly, it can be seen that, by age 18 years, rates of both ever use of cannabis and weekly use of the drug were broadly similar in the two countries: approximately half of each sample reported ever having used cannabis and just over 10% reported using it on at least a weekly basis. However, there was evidence to suggest quite substantial differences in the prevalence of cannabis use amongst younger samples: approximately a quarter of Australian respondents reported having used cannabis by age 14 years compared with only 3% of the New Zealand sample.

Table 3: Comparisons of cannabis use between Australia (1995 Household Survey Data) and New Zealand (CHDS Data)

	% Ever Used Cannabis		% Using Cannabis Weekly	
Age	Australia	New Zealand	Australia	New Zealand
14 Years	27.6	3.0	3.4	-
15 Years	26.7	9.9	10.0	2.1
16 Years	41.7	21.1	13.3	2.6
17 Years	40.7	41.9	6.8	-
18 Years	53.6	50.0	12.3	10.5

Before considering the implications of these results there are a number of caveats that should be considered. In particular, to the extent that the sampling and measurement procedures used in the study were not identical, it could be argued that any apparent differences in the rates of cannabis use between the two studies may reflect methodological artefacts rather than a true difference in the rate of cannabis use between the two countries.

In particular, one important difference between the studies concerns the age at which respondents were interviewed: Young people in the Christchurch sample were interviewed at the time of their birthdays while the Australian sample was interviewed within a set of period of 1995. Thus, while the average age of the 14 year olds in the Christchurch sample would have been close to 14.0 years it is probable that the average age of the Australian sample would have been close to 14.5 years. Given the rapid increase in initiation to cannabis use during this time (particularly in the Christchurch sample) it is possible that even this relatively slight difference in age could account for some of the difference in reported rates of cannabis use between the two samples. However, taking the conservative approach of comparing 15 year old New Zealanders with 14 year old Australians leads to the same general conclusions: rates of cannabis use appeared substantially greater amongst younger Australians but by age 18 years there were few apparent differences between the two countries in the rates of cannabis use.

Additionally, it should be noted that, while the Australian data is based on a national sample, the New Zealand data is based on a sample which is predominantly from one region in New Zealand. While it may be possible that there are some regional differences in rates of cannabis use in New Zealand, the extent of these differences remains largely undetermined. However, it seems improbable that the results reported in this paper could be solely a reflection of regional (New Zealand) differences.

Despite these caveats, the results summarised in Table 3 suggest a number of important conclusions regarding rates of cannabis use amongst youth in Australia and New Zealand:

1. Firstly, it is clear that the use of cannabis by youth is widespread in both

countries. By the age of 18 years approximately 50% of both samples reported having used cannabis at least once and just over 10% were using it on a weekly basis.

2. Secondly, although rates of cannabis use between the two samples appeared broadly similar at age 18, there were clear differences between the two samples at younger ages: approximately a quarter of the Australian sample reported having used cannabis by age 14 years compared with only 3% of the New Zealand sample.

These results suggest that the onset of cannabis use may be delayed in New Zealand youth, relative to Australia, but that by early adulthood similar numbers of young people will have used cannabis. It is difficult to determine the reasons for these apparent differences between New Zealand and Australia in the onset of cannabis use, but possible explanations may include the following:

Firstly, there appears to be far greater awareness of, and media attention directed at drug use and drug related harm in Australia. It is possible that this greater awareness and publicity may lead young people who are prone to cannabis use to experiment at earlier ages.

Secondly, it may be that there are differences between the two countries in the availability and method of obtaining cannabis. An earlier study based on the Christchurch cohort (Fergusson, Lynskey & Horwood, 1993) indicated that the majority of young people who had used cannabis by age 15 were obtaining the drug from friends or other acquaintances and only a minority (18%) of those who had ever tried cannabis reported having bought the drug themselves. It is possible that sources of supply differ between the two countries and that these differences lead to greater access and opportunity for young Australians to experiment with the drug.

It should be emphasised that the possibilities mentioned above are purely speculative and there appears to be no research which has compared rates of cannabis use between Australia and New Zealand and any potential explanations for differences in rates of cannabis use between the two countries. It should also be noted, however, that any mechanisms leading to earlier use of cannabis amongst Australian youth are likely to be relatively subtle as the evidence presented above suggests that these differences do not lead to overall differences in the use of cannabis amongst the adult population but just to an earlier onset of cannabis use amongst those who are liable to use the drug.

The Correlates and Consequences of Adolescent Cannabis Use

An ongoing issue concerning adolescent cannabis use has been the extent to which early use of cannabis is causally linked to a range of adverse outcomes including poor mental health, substance abuse and dependence, criminal offending, poor educational attainment and reduced life opportunities. There have been a number of cross sectional studies which have shown that risks of these various adverse outcomes are elevated in young people who use cannabis (Donovan & Jessor, 1985; Farrell, Danish & Howard, 1992; Fergusson, Horwood and Lynskey; 1994; Gillmore et al, 1991; Grube & Morgan, 1990; McGee & Newcomb, 1992). For

example, Fergusson et al (1994) reported highly significant associations between early onset cannabis use (before age 15 years) and a range of adverse outcomes including alcohol abuse (OR = 13.8; 95% CI = 6.2-30.4), precocious sexual activity (OR = 20.1; 95% CI = 11.1-36.5), conduct disorder (OR = 12.5; 95% CI = 7.1-22.1) and criminal offending (OR = 5.0; 95% CI = 2.7-9.0).

However, while these studies have demonstrated that a range of adverse outcomes are elevated in young people who use cannabis, the precise mechanisms underlying the observed associations remain controversial. There are essentially three broad classes of explanation that have been proposed in the substance use literature to explain the observed associations between cannabis use and other adverse outcomes:

Firstly, it has been proposed that early cannabis use causally influences later risks of substance abuse/ dependence, criminal offending, poor mental health and reduced life opportunities. This position has perhaps been most clearly articulated by Kandel and her associates (Kandel, Davies, Karus &Yamaguchi, 1986) who argue that: a) early cannabis use encourages later use of the drug; b) illicit drug use has a direct influence on anti-conventional behaviours including increased risks of delinquency, employment problems and difficulties in interpersonal relationships and; c) these consequences will vary with the extent of the individual's use of the drug.

Alternatively, it has been proposed that the causal chain is reversed and that substance use is, in fact, a consequence of other adverse conditions such as reduced life opportunities and, in particular, poor mental health. This perspective, commonly known as the self medication hypothesis, has been supported by findings that many drug users report that their drug use helped them to feel "normal" (Khantzian, 1986).

Finally, it could be argued that the observed associations between early cannabis use and other adverse outcomes in adolescence and young adulthood are wholly non causal but arise from the effects of common life circumstances and risk factors that increase risks of both early cannabis use and other adverse outcomes. There is considerable indirect evidence to support this hypothesis to the extent that the risk factors and life pathways that have been shown to be associated with early cannabis use overlap considerably with the risk factors and life pathways that have been shown to be associated with poor mental health, criminal offending and reduced life opportunities. These risk factors have been reviewed by a number of authors (e.g., Hawkins et al, 1992; Kandel, 1980; Newcomb & Bentler, 1989) and include the following: general measures of the extent to which the norms and attitudes of the wider community encourage or discourage the use of drugs; measures of social disadvantage and family dysfunction; individual factors including personality and an individual's generalised propensity to norm violating behaviours; and the extent to which an individual affiliates with delinquent or substance using peers.

Early Cannabis and Later Substance Use

While the linkages between early cannabis use and other adverse outcomes remain controversial, both from a scientific and public policy perspective, there appears to have been little published research which adequately addresses the origins of these

linkages. Although many studies have documented the linkages between cannabis use and other adverse outcomes, including increased risks for the use of other illicit drugs, the only way to adequately address issues concerning the origins of these linkages is through the use of longitudinal designs which measure cannabis use and other outcomes at multiple time points throughout adolescence and young adulthood.

One area in which there has been considerable research has concerned the extent to which the use of cannabis during adolescence is predictive of progression to the use of other, "harder" illicit drugs. For example, Kandel (1975) obtained data on sequences of use over time of a range of substances from two cohorts of New York high school students: a) a sample of 5468 public secondary school students who completed questionnaires twice, at intervals of 5-6 months and; b) the senior class members from this sample who were re-contacted 5-9 months after leaving high school. The data were analysed using conventional methods of Guttman scalogram analysis (Guttman, 1950) and the analyses indicated the existence of an "invariant sequence" in the development of substance use such that four separate stages in substance use could be distinguished: beer or wine, or both; cigarettes or hard liquor; marijuana; and other illicit drugs.

This general finding that drug use during adolescence falls along a Guttman scale has been replicated by a number of authors (Adler & Kandel, 1981; Ellickson et al, 1992; Fleming et al, 1989; Graham et al, 1991; Kandel et al, 1992; Welte & Barnes, 1985; Yamaguchi & Kandel, 1984) and has been used to form the basis of stage theory which implies that use of one drug further down the sequence in some way facilitates the use of drugs at higher levels. Thus, for example, the use of cannabis is assumed to increase the risk of subsequent illicit drug use independently from the influence of any background or contextual factors. However, the finding that drug use falls on a Guttman scale does not, in itself, indicate that the use of one drug facilitates the use of drugs higher up the sequence (Johnson, 1973). On the contrary, the evidence from these studies is also consistent with the hypothesis that drug use is determined by a single underlying dimension of vulnerability to drug use or "transition proneness" (Jessor & Jessor, 1977) and that the use of different drugs at different times is an opportunistic response to changing environmental conditions such as availability. Thus, the appearance of a Guttman-like scale in substance use may be due, not to the facilitative effects of the use of one drug class on the use of another, but rather to increasing availability and access with increasing age.

To indicate that the use of one drug facilitates the use of other drugs independently from the effects of contextual factors would require the demonstration that the use of one drug is a risk factor for the use of other drugs when the correlated effects of a range of contextual factors are statistically controlled. An early attempt to demonstrate this was reported by Yamaguchi and Kandel (1984b) who used event history analysis to describe the determinants of progression in substance use. They found that the transition to use of illicit drugs other than cannabis was predicted by age, prior use of cannabis or prescribed psychoactive drugs, early initiation of cannabis use (aged 15 or less) and friends' cannabis use. They concluded that:

"The findings on this paper suggest potentially important policy implications for the development of preventive and educational efforts, namely that prevention of early involvement in legal drugs would reduce the use of cannabis, and that prevention of early involvement in cannabis use would reduce involvement in other drugs."

(Yamaguchi & Kandel, 1984b; pp 679-680)

Early Cannabis Use and Other Outcomes

While the work of Kandel and her associates has focussed predominantly on the effects of early substance use for the development of subsequent substance use, a more broad approach was adopted by Newcomb and Bentler (1988) who used eight year longitudinal data collected on a sample of 654 high school students to examine the impact of early substance use on a range of outcomes in young adulthood (ages 19-24 years) including interpersonal relationships, family formation and stability, criminality, educational attainment, employment and mental health. These authors used methods of structural equation modelling to examine the extent to which a latent factor of substance use, modelled as a function of observed reports of cannabis, alcohol and drug use, was associated with a range of adverse outcomes in young adulthood after the effects of antecedent confounding factors had been taken into account. The results of these analyses indicated that early substance use made significant independent net contributions to a diffuse range of outcomes assessed in young adulthood. The authors concluded (page 205) that adolescent substance use "leads to problems in several areas of life including livelihood, emotional functioning, criminal involvement, and an abandonment of traditional pursuits, such as a college education." While these analyses did not suggest any specific effects of early cannabis use, the cannabis use indicator was very highly correlated with the latent substance use factor (r=.98) and thus, as the authors note, the effects of the general substance use factor observed in this study are likely to be highly similar to the effects of cannabis use on later adjustment.

The results of this study have been further supported by a study reported by Fergusson, Lynskey and Horwood (1996) who examined the extent to which early cannabis use (before the age of 15 years) had adverse consequences for subsequent drug use, criminal offending, mental health and life opportunities after the effects of a wide range of potentially confounding factors had been taken into account. The results of this study lead to the following conclusions:

1. Firstly, sample members who had used cannabis by the age of 15 years (approximately 10% of the sample) had significantly elevated risks of a range of adverse outcomes by the age of 16 years including substance misuse, delinquency, school problems and poor mental health.

2. While these results may have suggested that early onset cannabis use was a factor which causally influenced an individual's risks of subsequent adverse outcomes, young people who reported early onset cannabis use had also been exposed to a range of other adversities, including early tendencies to delinquency, poor mental health, educational underachievement, affiliations with delinquent or substance using peers and family dysfunction.

3. To examine the effects of early onset cannabis use on subsequent outcomes

after the effects of these potentially confounding covariates had been taken into account, Fergusson et al (1996) fitted a series of logistic regression models to the data in which the log odds of each outcome assessed at age 16 years was modelled as a function of the individual's cannabis use at age 15 and each of the potentially confounding covariates. The results of this analysis indicated that, after the effects of potentially confounding covariates had been taken into account, the associations between early onset cannabis use and the majority of the outcomes studied were non significant, indicating that early cannabis use did not causally influence later risks of a range of adverse outcomes including alcohol misuse, daily tobacco use, conduct disorder, self report offending, anxiety disorders, depression and suicidal ideation.

4. However, even after the the effects of confounding covariates had been statistically controlled, young people who used cannabis before the age of 15 years were 6.7 (95% CI = 3.4 to 13.3) times more likely to be using cannabis at age 16 years and 3.1 (95% CI = 1.2 to 7.9) times more likely to have left school before the age of 16 years, the official minimum school leaving age in New Zealand. Additionally, there were marginally significant associations ($p<.10$) between early onset cannabis use and both police contact and frequent truancy: after control for confounding covariates young people who had used cannabis by the age of 16 years were 2.1 (95% CI = 0.9-4.8) times more likely to have been in official police contact during the interval from 15 to 16 years and 2.0 (95% CI = 1.0-4.2) times more likely to report frequent truancy during this period.

In a subsequent follow up of the same cohort in which the influence of early onset cannabis use, defined as occurring before the age of 16 years, on a range of outcomes assessed at age 18 years was examined, Fergusson and Horwood (1997) reported a broadly similar set of conclusions. The results of their analyses are summarised in Table 4 and lead to the following conclsuions:

1. Firstly, the figure in the first column give estimates of the odds ratios between frequent cannabis use (defined as having used cannabis on ten or more occasions) at age 16 years and a range of measures assessed at age 18. These measures span substance use, criminal offending, mental health and life opportunities. The odds ratios give an estimate of the risk of each outcome in those who had used cannabis relative to sample members who had not used cannabis by the age of 16 years. These odds ratios ranged from 2.6 to 57.1 and it can be seen from these results that young people who had used cannabis on ten or more occasions by the age of 16 years had greatly elevated risks of a range of adverse outcomes by age 18 years.

2. The second column of the Table shows the odds ratios between cannabis use by age 16 years and each of the outcomes after statistical control for a range of potentially confounding covariate factors. These factors were assessed prior to the age of 16 years and included measures of family dysfunction, early behavioural disturbance and the nature of peer affiliations during early adolescence. The associations betwen cannabis use and each outcome were controlled for the potentially confounding effects of these factors using regression methods and it can be seen that, after such adjustment, the

Table 4: Comparison of odds Ratios (95% confidence intervals) between cannabis use and outcomes: a) before adjustment for other factors; b) after adjustment for confounding covariates and; c) after adjustment for confounding and intervening factors.

	Unadjusted	Covariate Adjusted	Adjusted for Covariate and Intervening Factors
Substance Use			
Cannabis Abuse/ Dependence	57.1 (27.2-119.9)	8.6 (4.5-16.6)	4.4 (2.2-8.7)
Alcohol Abuse/ Dependence	8.0 (4.4-14.8)	1.3 (0.6-2.6)	-
Other Substance Use	5.7 (3.4-9.8)	7.0 (3.5-14.0)	3.0 (1.4-6.5)
Offending			
Violent Offending	7.5 (3.9-14.7)	2.9 (1.4-6.4)	2.1 (0.9-4.8)
Property Offending	6.2 (3.3-11.6)	2.1 (1.0-4.7)	2.1 (0.9-4.8)
Arrested	28.5 (12.7-64.3)	8.4 (3.3-21.8)	3.5 (1.1-10.8)
Convicted	18.6 (8.6-40.1)	5.0 (1.9-13.0)	1.7 (0.5-5.7)
Mental Health			
Major Depression	3.8 (2.1-6.8)	1.8 (0.9-3.5)	-
Anxiety Disorders	2.6 (1.4-4.9)	1.0 (0.5-2.2)	-
Attempted Suicide	11.4 (4.9-26.6)	2.3 (0.7-8.1)	-
Life Opportunities			
Unemployed 3+ Months	5.7 (3.0-10.7)	3.2 (1.6-6.3)	1.2 (0.5-2.8)

associations between early cannabis use and subsequent outcomes were substantailly reduced. After adjustment for confounding factors the odds ratios between early cannabis use and subsequent outcomes ranged from 1.0 to 8.6. Importantly, after such adjustment the associations between early cannabis use and three of the outcomes (major depression, anxiety disorders and attempted suicide) were no longer statistically significant. This indicates that the apparent association between early cannabis use and these outcomes could be wholly explained by the effects of confounding factors which were associated with

increased risks of early cannabis use and which, independently of this, were associated with elevated risks of mental health problems in young adulthood.

3. Finally, the third column of the Table shows the associations between early cannabis use and subsequent outcomes after control for two sets of factors: a) the confounding covariates described above and; b) potentially intervening factors including the nature of peer affiliations during the interval from 16 to 18 years. The results in this column of the Table show that the effects of controlling the associations between early cannabis use and later outcomes for the effects of both confounding factors (assesed prior to age 16) and intervening factors (assessed for the period from 16 to 18 years) were to further reduce the apparent associations between early cannabis use and later outcomes. After such control the odds ratios between early cannabis use and later outcomes reduced to between 1.2 to 4.4.

In discussing these results Fergusson and Horwood (1997; page 294) concluded:

> "It would be misleading .... to argue too strongly that cannabis use by young people is a factor that leads to seriously increased risks of psychosocial disorder in adolescence. Most of the elevated risk seen among early onset cannabis users is likely to arise from factors that were antecedent to the decision to use cannabis, rather than as a consequence of cannabis use.
>
> Nonetheless, early onset usage is not without risks and those engaging in these behaviours may be more vulnerable to later psychosocial problems as a result of the social context within which cannabis is used and obtained."

In conclusion, the results of the studies summarised above indicate that young people who use cannabis are at increased risks for a wide range of adverse and potentially harmful outcomes including other substance use and abuse, criminal behaviour, poor mental health, impaired educational achievement and reduced life opportunities. Available evidence suggests that a large component of these associations does not reflect simple cause and effect relationships between the extent of cannabis use and other outcomes. Instead, these associations arise because the risk factors and life pathways that predispose young people to cannabis use are the same as, or overlap with, the risk factors and life pathways that place young people at increased risks of these other outcomes. However, there is also evidence to suggest that early cannabis use acts to place young people at (mildly) elevated risks of some negative outcomes, and particularly increased substance use behaviours. A potential mechanism underlying these associations, as suggested by Fergusson and Horwood (1997), is that early cannabis use is accompanied by adoption of an unconventional lifestyle characterised by increased affiliations with delinquent or substance using peers and disengagement from conventional social structures including education and employment.

These results have a number of clear implications for the prevention of both early substance use and other problems of adjustment. Firstly, to the extent that early cannabis use often occurs in the context of a range of other adversities and that a

large component of these comorbidities because there is a common set of risk factors which predispose young people to a wide range of adverse outcomes, prevention efforts should be broadly targeted at preventing a range of adverse outcomes rather than focussing on a specific outcome. Secondly, the results suggest that the elimination or reduction or adolescent cannabis use would, by itself, have relatively little impact on the frequency and extent of other problems of adjustment including criminal offending, mental health problems, precocious sexual activity, educational failure and reduced life opportunities.

ACKNOWLEDGMENTS

I would like to thank David Fergusson and John Horwood for providing me with access to data from the Christchurch Health and Development Study and for allowing me to present it here. The Christchurch Health and Development Study is funded by grants from the Health Research Council of New Zealand, the National Child Health Research Foundation, the Canterbury Medical Research Foundation and the New Zealand Lottery Grants Board. The Australian data presented in this report was collected as part of the National Drug Strategy Household Survey (1995), funded by the Commonwealth Department of Health and Family Services.

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ONE YEAR ON: A FOLLOW-UP OF LONG-TERM CANNABIS SMOKERS

Wendy Swift, Wayne Hall and Jan Copeland

INTRODUCTION

There has been little longitudinal research on drug use, and in particular the use of cannabis. Much of what we know about patterns and effects of use has been learned from cross-sectional research, which provides only limited information on the natural history of use, and often relies heavily on retrospective accounts. Nevertheless, valuable insights into the patterns and correlates of changes in drug use among the general population have been gained from a small number of prospective epidemiological studies. Denise Kandel's landmark work has contributed important information on the initiation, escalation and cessation of drug use. For example, Kandel and Raveis (1989) found similarities in the predictors of cannabis use initiation and continuation (but see Hammer and Vaglum, 1990, who did not replicate this finding). Previous drug involvement was the strongest predictor of continued use, while those who had initiated earlier, used more heavily, had used other illicits and used for psychological rather than social reasons were more likely to persist with use. The recently published fourth wave (19 year) follow-up (Chen and Kandel, 1995) has confirmed a maturational trend to cessation of marijuana use from the mid-twenties, although it showed the highest persistence of the illicit drugs. The prevalence of daily use and the prevalence of heavy use among daily users declined over time.

The Monitoring the Future Project (Bachman et al, 1997) followed successive nationally representative cohorts comprising more than 33000 young American adults over two decades, interviewing them every two years. They found remarkable stability in marijuana use, with a modest age-related decline from the mid-twenties. Similar to the data on alcohol, they found that increases in use following high school resulted from the new freedoms associated with leaving home, while the later decrease reflected new responsibilities such as marriage and parenthood. The authors also note that due to the general low frequencies of use, the findings could rarely be ascribed to dependence.

Due to the low prevalence of regular cannabis use in the general population (Donnelly and Hall, 1994), epidemiological research does not necessarily tell us much about the experiences of long-term users. It is not clear that correlates of use patterns in the general and heavy using populations are similar, while the former group allow only a limited understanding of dependence issues. One of the few population studies to address this issue is that of Newcomb (1992), who reported data from a 12 year prospective study of more than 1000 school children who were

followed on five occasions. Longitudinal analyses of a subset of this group were conducted to investigate predictors of various forms of cannabis abuse. Cannabis consumption in Year 5 significantly predicted consumption in the final year, though it was not sufficient to explain abuse, which was significantly influenced by measures of psychosocial vulnerability, risk and protection. However, as this study was conducted on an adolescent population, it does not necessarily relate to the experiences of older, more chronic users.

Two projects of note specifically recruited regular marijuana users, although these were conducted between 10 and 20 years ago. Haas and colleagues (Haas, 1987; Hendin et al, 1987) recruited 150 heavy marijuana smokers and conducted a series of five unstructured psychodynamic interviews with 15 of them about their lives and marijuana use. This group was followed up 20 months later and participated in an average of two open-ended interviews. The authors concluded the sample were operating well below their abilities, but rather than being the cause, cannabis was an integral part of their attempts to escape problems. Halikas and colleagues (Halikas et al, 1983, 1984; Weller and Halikas, 1982, 1985) followed an initial group of 100 regular users and 50 non-using friends over a 6 to 8 year period, and examined changes in cannabis and other drug use patterns, and psychological functioning. This research showed general stability in the reported effects of cannabis, although there was a small decrease in the frequency of desirable effects of use. Patterns of use had polarised to either daily or occasional use, although they were significantly correlated with original frequency. There was a general decline in the use of other drugs with the exception of alcohol, and again, use was correlated with that reported at the initial interview. There was no significant increase in the number of users with a diagnosable psychiatric illness, while marijuana use was inconsistently related to psychosocial variables, especially after accounting for childhood factors.

Despite this body of work, there is still scant detailed research on changes in dependence. Smart (1994) notes that this situation is hampered by differing definitions of dependence, a reliance on retrospective accounts of change and inconsistent methodologies. There is still conflicting evidence for a natural progression of dependence and a limited understanding of the correlates of the escalation from recreational use to dependence, although greater information is available on factors associated with decreased dependence. Availability and personal motivation are cited as most consistently related to all types of change, with psychological problems, social stability and religious experiences less clearly established correlates (Smart, 1994).

This chapter consists of data collected from a one year follow-up interview of a sample of long-term cannabis users recruited in Sydney (Swift, Hall & Copeland, 1997). The study aimed to provide data on the characteristics and beliefs of long-term users, with a focus on the prevalence and correlates of cannabis dependence among this group. In order to examine measurement issues relevant to the diagnosis of dependence, it utilised a number of dependence measures which provided slightly different operationalisations of the drug dependence syndrome.

The aim of the follow-up component was to examine the stability of, or conversely any changes in, patterns and contexts of cannabis use and dependence over one

year and to investigate factors that may predict these variables at follow-up.

METHOD

Sample

All respondents who participated in the initial interview were re-contacted approximately 12 months later. Ninety percent (n=179) of the original sample were located and eighty-one percent (n=162) were re-interviewed. Seventeen of those who were located failed to be re-interviewed, primarily (15/17) because they repeatedly failed to return phone calls or letters or keep appointments. Two clients were lost to follow-up because they returned telephone calls or letters more than six months after their follow-up interview was due.

The Interview

The follow-up interview employed a modified version of the structured questionnaire administered to the original sample to gather information on respondents' characteristics and experiences a year after the initial interview. This enabled an assessment of changes in behaviour and attitudes in the intervening year.

The areas addressed by the interview were: demographics, drug use other than cannabis, cannabis use patterns and context of use, cannabis dependence, psychological and physical health, and treatment issues.

Cannabis dependence in the preceding 12 months was measured using three of the four instruments administered at the initial interview - the University of Michigan Short CIDI (UM-CIDI) (Kessler et al, 1994), the Ontario Adult Drug Use Questionnaire (Adlaf, Ivis and Smart, 1994), and the Severity of Dependence Scale (SDS) (Gossop, et al, 1992).

For each instrument, questions were asked only in relation to cannabis use. As before, the short form of the UM-CIDI was administered by the first author, while the remaining instruments were self-completed. The CIDI-SAM, which assessed lifetime dependence, was not re-administered.

Procedure

Interviews were conducted between August, 1996 and July, 1997, a mean of 383.8 days (range: 318-485) after their initial participation. As before, respondents were assured that only the interviewer would have access to their data, while the interview was identified only by number, which was linked to the consent form to facilitate future data collection.

The interview took a median of 35 minutes to complete (range: 20-125 minutes). The majority of follow-up interviews (93%) were conducted face-to-face, with the remaining seven percent being self-completed and returned by mail, as face-to-face interviews were not possible. Respondents were thanked and reimbursed up to $20 for costs incurred. A small number were referred to alcohol and other drug information services for referral to treatment. Interviews were kept in a locked filing

cabinet, and identifying information and consent forms were kept in a separate locked cabinet. Only the interviewer had access to any of this information.

Data Analysis

Descriptive and multivariate analyses were conducted using SPSS for Windows (Version 6.0). Principal components analyses (PCA) of the items comprising the Severity of Dependence Scale were conducted using the Factor module of SPSS for Windows, while those for the short UM-CIDI and the ICD-10 measure using the Factor module of SYSTAT6.

Descriptive analyses are presented for all major variables. Percentages are reported for categorical variables, while means and medians are reported for normally distributed and skewed continuous variables, respectively. A number of univariate comparisons of major variables of interest identified from the literature are reported. Chi-square statistics are presented for categorical data, and t-tests or Pearson's product moment correlations are presented for continuous variables.

A limited number of multivariate longitudinal analyses were conducted to investigate changes in cannabis use and dependence between the original and follow-up interviews. Logistic regression models were estimated for categorical outcome variables, with backward elimination of variables according to the Likelihood Ratio Test (Hosmer and Lemesow, 1989). Multiple linear regressions were constructed for continuous outcome variables, and analyses of the residuals conducted to test for violations in the assumption of normality.

RESULTS

Predicting Participation in Follow-up

The original (n=200) and follow-up (n=162) samples were compared to investigate characteristics predictive of participation in the one year follow-up interview. Univariate analyses revealed that age, gender, employment status, whether in a relationship and polydrug use were related to follow-up status. After adjusting for these variables, gender and polydrug use were independently associated with follow-up status (χ^2, 2df=20.0, p<0.001). Males remained significantly less likely than females to have participated (adjusted OR=0.3; 95%CI=0.1, 0.8; χ^2_{WALD}, 1df=6.6, p=0.01), while for every extra drug class consumed, the chance of participating decreased by approximately half (adjusted OR=0.6; 95%CI=0.4, 0.8; χ^2_{WALD}, 1df=12.4, p=0.0004).

Demographics

Selected demographic characteristics of the follow-up sample are presented and compared to the earlier sample in Table 1. Just over half the sample were male (54%). As noted above, women were significantly more likely to have participated in follow-up, and this is reflected in the decrease in the proportion of men in the follow-up sample (54% vs 58%). Respondents were of a similar age (after allowing for the one year follow-up period). The mean age was 30.0 years (SD=7.5; range: 18-58) and men were significantly older than women (mean of 32.2 vs 27.4 yrs; t_{160}=-4.3,

p<0.0001).

Sydney remained the residence of the majority (93%) of respondents, with small proportions living interstate (6%) or overseas (1%). More than half (55%) had not moved residence in the intervening 12 months, with 22% having moved once and 23% more than once.

Table 1: Demographic characteristics of follow-up (n=162) and initial (n=200) samples

	Follow-up Sample			Original Sample
Variable	Total	Men	Women	
Gender (%)	100	54	46	58% male
Age (yrs)				
mean	30	32	27	28
range	18-58	21-58	18-46	17-57
Employment status (%)				
student	19	12	28	19
full-time work	41	51	29	28
p-time/casual work	25	22	29	22
self-employed	13	20	5	8
unemployed	16	15	17	30
pension/benefits	9	8	11	10
Living situation (%)				
alone	12	18	5	12
partner	27	20	36	22
partner & children	12	13	12	10
children only	7	2	13	6
relatives	14	13	15	19
friends	24	25	23	29
share household	9	12	7	9
Currently in relationship	63	55	72	59
Live with dependent children	18	13	24	16

Seventy percent of this group were currently in full-time, part-time or casual employment, compared to 56% of the initial sample. Living arrangements, and the likelihood of being in a relationship or living with dependent children remained similar across the two samples. Most commonly, follow-up respondents reported living with their partner only (22%) or with friends (24%). More than half (63%) were currently in a relationship, while 17% were currently living with children under 16 years of age.

Women were significantly more likely to report being in a relationship (72% vs 55%; χ^2, 1df=4.9, p=0.03).

Patterns of Cannabis Use

Nearly one in five (19%) respondents were now using cannabis less than weekly or not at all, a level which would have made them ineligible for the initial interview (Table 2). Nevertheless, half the sample (51%) were using cannabis daily, and approximately one third (30%) were using between one and six days a week. There were no gender differences in frequency of use (χ^2, 1df=5.7, p=0.5). The majority of respondents (91%) had used cannabis in the previous month, smoking a mean of 6.7 "standard cones" per day (SD=6.3, range=0.1 to 30). There were no significant gender differences in amount smoked (mean of 6.9 standard cones for women and 6.5 for men; t_{145}=0.39, p=0.7).

Use patterns were still fairly stable, with two thirds (66%) saying their use had been this way for at least one year. Of the thirteen people no longer using, one had been abstinent since the initial interview, four for between six months and a year, and eight for between one and six months. On balance, one third (32%) believed their level of use was the same as at the initial interview. Half believed they had decreased their use (either by smoking less frequently, or by smoking less on each use occasion), while 18% claimed it had increased.

Respondents' perceived changes in use were checked against the change calculated from the frequency of use at the initial and follow-up interviews. Discrepancies between "real" and "perceived" changes existed in one quarter (28%) of cases. Thus, 16% of the sample incorrectly believed their use had decreased, while 12% believed their use had increased when it had not. Further, there were discrepancies between stated intentions towards use at the first interview and patterns of use at the second interview. Thus, 60% of those who had intended to moderate their use in this time (37/62 people) were using at the same or increased levels, while 30% of those who had no intentions of moderating their use (30/100 people) had quit or cut down.

Contexts of Cannabis Use

Contexts of use were largely unchanged compared to the initial interview (see Table 3). The most common route of administration in the last year remained smoking in a bong or waterpipe (83%), followed by smoking joints. The apparent increase in the proportion who had smoked joints may be partly due to slight differences in the wording of these questions. In the initial interview respondents were asked about their main route of administration, whereas in the follow-up interview they were asked about all routes of administration during the intervening year. Not surprisingly, the sample continued to prefer the "heads" of the cannabis plant (91%), with one in five (22%) having used leaf. The majority of respondents (80%) also continued to mix a mean of 36% (SD=14.4, range: 4-75) tobacco with their cannabis.

Location of cannabis use, and the people they used with remained similar. Thus, the most popular location of use was in the respondent's home (94%), while the

majority of the sample smoked with friends (78%). There was slight movement around favoured smoking times, although this may again be partly attributable to slight differences in the wording of the questions. Nevertheless, evening (44%) and night (57%) remained the favoured times to smoke.

Three quarters (77%) of those with partners said that their partner smoked cannabis; women again more often than men (89% vs 63%;χ^2, 1df=9.8, p=0.002). A greater proportion of the follow-up sample with dependent children (43% vs 30% of the initial group) smoked with or in front of their children, although this may reflect the increased proportion of women in the sample.

Table 2: Patterns of cannabis use among follow-up (n=162) and original (n=200) samples.

	Follow-up Sample			Original Sample
Variable	Total	Men	Women	
Average frequency of use (%)				
daily	51	46	57	56
4-6 days/week	11	14	8	18
2-3 days/week	13	16	9	20
weekly	6	5	8	7
<weekly	10	9	11	-
<monthly	1	1	0	-
no current use	8	9	7	-
Length of current use (%)				
<1 month	1	1	1	-
1 to <6 months	20	21	19	-
6 to <12 months	13	12	15	-
1 to <5 years	35	31	39	-
at least 5 years	32	36	27	-
Perceived change in use (%)				
using the same	32	39	31	-
using more	18	17	20	
using less	50	51	49	-

Table 3: Context of cannabis use* among follow-up (n=162) and original (n=200) samples.

Variable	Follow-up Sample Total	Men	Women	Original Sample
Methods used (%)				
bong/waterpipe	83	83	84	83
joint, cannabis only	15	16	15	13
joint, including tobacco	40	41	37	15
chillum/pipe	9	12	7	6
eaten	12	9	16	2
Kinds of cannabis (%)				
heads	91	93	88	93
leaf	22	20	25	22
hash	11	7	15	5
mix of heads and leaf	11	10	11	4
Location of use				
home	94	94	93	92
other home	62	59	67	67
work	4	7	0	2
public place	33	39	25	41
in a car	11	8	13	13
Time of day (%)				
morning	7	7	7	11
afternoon	15	18	12	23
evening	44	53	35	41
night	57	61	52	47
all day	5	5	5	8
anytime	27	22	33	19
Smokes with ... (%)				
alone	44	47	40	39
partner	43	30	59	38
friends	78	79	77	83
relatives	6	5	8	9
strangers	2	1	3	2
Partner smokes (%)				
(n = 102)	77	63	89	86

*There was a slight difference in the wording of context questions between the two interviews. The initial interview asked for the main route of administration, location of use and so on, while the follow-up interview tried to identify all of these for the intervening year.

Reasons for, and Experiences of, Use

Reasons for use remained similar to those initially reported. Thus, the most common reasons were to relax or assist with sleep (56% vs 60% of the initial sample) and the enjoyable feeling of being stoned (34% vs 40%). One in five (21%) now used for recreational or social reasons, whereas this was rarely cited by the initial sample. A similar proportion said they used due to habit or addiction (16% vs 18%), while the proportion who used to relieve negative mood states or aid in problem solving halved (9% vs 17%).

Relaxation and calm were still the most common experiences of use (35% vs 33% of the initial sample). Similar proportions reported feeling tired, lazy or demotivated (13% vs 15%), relief of negative mood states or mood enhancement (13% vs 12%), or paranoia or other negative mood states (10% vs 8%). There was a decrease in those reporting tolerance (11% vs 21%) and an increase in reports of memory impairment and vagueness (10% vs 2%).

There was stability in the most frequently cited pros and cons of use. The most common "good things" about cannabis use remained its relaxing, calming effects (68% vs 60% of the initial sample), followed by its ability to provide a change of consciousness, enhanced senses and creativity (31% vs 40%). The cost or financial problems associated with use (25% vs 21%), demotivation, lethargy and neglect of other activities (20% vs 14%), paranoia (15% vs 16%), possible respiratory effects (both 14%), illegality and periodic supply problems (13%), were again the major negative effects of use.

When asked specifically about the relationship between cannabis use and lack of motivation, approximately two thirds of the follow-up sample (66%) believed that marijuana use, particularly heavy use, could result in a lack of motivation and a loss of interest in achieving. A further eight percent believed this was sometimes the case, while 10% believed this to be true of others rather than themselves. Only 14% did not believe cannabis had effects on motivation. More than half the sample (56%) had felt cannabis had affected their motivation in the last 12 months.

Source and Criminal Activity

The majority of the sample continued to buy their cannabis from friends, relatives or acquaintances (74% vs 70% of the initial sample), while 40% had grown a mean of 37% of their supply (SD=32.0; range:1-100%) (see Table 4). Men grew a significantly greater amount of cannabis than women (44 vs 24%; t_{52}=-2.4, p=0.02). Compared to the initial sample, a greater proportion of the follow-up group grew cannabis (40% vs 19%) or received it as a gift (33% vs 12%), although again, this may be partly due to inconsistencies in the wording of the questions.

In general, cannabis was considered easy or very easy to get (86% vs 80% of the full sample). Half the sample (54%) believed that availability had not changed since the first interview, while one third (31%) thought access was easier. Only 13% found cannabis harder to obtain than when first interviewed.

Half (55%) the sample believed the price of cannabis had not changed in a year.

Equal proportions believed the cost had increased (18%) or decreased (19%). Respondents spent a median of 10% of their weekly income on cannabis (range: 0-90%), while 13% spent more than one third of their income on it.

Table 4: Cannabis supply and criminal activity among follow-up (n=162) and original (n=200) samples*

Variable	Follow-up Sample			Original Sample
	Total	Men	Women	
Supply (%)				
grow own	40	41	39	19
dealer	36	39	32	36
friends/relatives	74	75	73	70
gift	33	28	40	12
payment	7	9	5	2
How easy to get (%) (n = 158)				
very easy	57	67	44	51
easy	29	24	33	29
quite difficult	6	5	8	4
very difficult	1	1	1	3
it varies	7	2	13	14
Cost comparison (%)				
same	55	49	63	-
more	18	17	19	-
less	19	24	13	-
varies	3	5	6	-
don't know	5	5	6	-
Undetected cannabis-related crime in last year (%) (n = 160)	7	7	7	11
none	42	38	47	-
growing	41	41	40	-
dealing	34	36	32	-
property crime	2	0	4	-
against person	1	0	1	-
fraud	1	0	3	-

*NB: There was a slight difference in the wording of context questions between the two interviews. The initial interview asked for the main source of cannabis and so on, while the follow-up interview tried to identify all of these for the intervening year.

Only three percent of respondents (five people, all but one male) had received a cannabis-related conviction in the last year. These were for possession (four people) and dealing (one person). More than half (58%) claimed to have committed

an undetected cannabis-related offence (other than possession) since the first interview. The most common offences were growing (41%) and dealing (34%). Only three people (two females and a male) had spent time in gaol (for any offence) since the initial interview, for one or two months only.

Other Drug Use

The majority of people (99%) continued to use drugs other than cannabis in the last year (mean of 3.4 (SD=1.7; range: 0-8)), with 93% continuing to use other drugs at least monthly (mean of 1.9 (SD=1.0; range: 0-5)). Alcohol and tobacco had been used by at least three quarters of the group on at least a monthly basis, while less than half had used the other drug classes. There were no gender differences in polydrug use.

The follow-up and initial samples had similar drug use patterns in the month before each interview. Polydrug use was the norm, with 94% (compared to 95% of the initial sample) having used a mean of 2.3 (SD=1.2; range: 0-6) drug classes other than cannabis. There were no gender differences in the number of other drugs used in the last month (mean of 2.1 for women and 2.4 for men; t_{160}=-1.5, p=0.13). Again, for both samples the most frequently used drugs were alcohol and tobacco.

Those who had consumed alcohol in the last year again completed the AUDIT, which provided a measure of the potential harm caused by their drinking patterns. The average score on the AUDIT was 10.0 (SD=6.6; range: 1-34), with men scoring significantly higher than women (11.5 vs 8.3; t_{155}=-3.1; p=0.003). Using the WHO cut-off (a score of at least 8), 58% of current drinkers (69% of men and 45% of women) displayed this consumption pattern. Men were significantly more likely to have been drinking at dangerous levels than women according to these criteria (χ^2, 1df=9.1, p=0.003). Using the alternative Australian cut-off (Conigrave et al, 1995) (a score of 6 or more for women and 7 or more for men), 68% of the sample were classified as problematic drinkers (71% of men and 64% of women). There were no gender differences according to these criteria (χ^2, 1df=0.89, p=0.34).

These figures are very similar to those reported for the full sample, who scored an average of 10 on the scale. According to the WHO criteria, 64% of drinkers (70% of men and 54% of women) were defined as drinking hazardously, while the Australian criteria defined 73% of drinkers (74% of men and 72% of women) in this way.

One quarter of the sample (24%) claimed to have experienced a problem with, or sought help for a drug other than cannabis since the initial interview; there were no gender differences (27% of men vs 19% of women; χ^2, 1df=2.2, p=0.14). This drug was most commonly heroin (11%), largely due to those on a methadone program (11 people), or alcohol (6%). This problem was current for two thirds of this group.

Cannabis Dependence

More than three quarters of the sample (81%) were classified as dependent on at least one of the three dependence measures administered in the follow-up interview. While 14% were dependent on only one, 23% were dependent on two and 44% were dependent according to all three measures. Two people who had been free of

dependence at the first interview were subsequently diagnosed as dependent on at least one of the instruments at follow-up. Conversely, 24 people who had either a lifetime or current dependence diagnosis at the initial interview were not diagnosed as dependent at follow-up.

The Short UM-CIDI

According to the UM-CIDI, 70% of the sample qualified for a DSM-III-R diagnosis of dependence in the last year (see Table 5). The mean score was 3.7 (SD=2.1; range: 0-7). There were no gender differences in total UM-CIDI scores (mean of 3.8 for women and 3.5 for men; t_{159}=0.74, p=0.46), or on the likelihood of receiving a dependence diagnosis (69% of women vs 70% of men; χ^2, 1df=0.03, p=0.9). Twenty five respondents were dependent according to this instrument at the initial but not at the follow-up interview, while 14 were dependent at follow-up that had not been previously.

A smaller proportion of the follow-up group were diagnosed as dependent (70% vs 77% of the original sample). The following items were markedly less frequently endorsed at follow-up than initial interview: intoxication while at work, school or with children (53% vs 63% of full sample), spending a lot of time using and recovering from cannabis (51% vs 66%) and tolerance (56% vs 66%).

Ontario Adult Drug Use Questionnaire (ICD-10)

Almost two thirds of respondents (62%) qualified for an ICD-10 diagnosis of dependence in the last year. A mean of 3.2 criteria were met (SD=1.9; range: 0-6) (see Table 6). There were no gender differences in the likelihood of receiving a diagnosis (59% of men vs 65% of women; χ^2, 1df=0.8, p=0.4)) or in the number of criteria met (mean of 3.3 for women and 3.1 for men; t_{160}=0.7, p=0.5). Thirty one respondents were dependent at initial interview but not at follow-up, while 15 people received an ICD-10 diagnosis at follow-up but not at initial contact. Again, fewer follow-up respondents were dependent on this instrument (62% vs 72% of the initial sample). The biggest differences in endorsed criteria occurred for tolerance (51% vs 62% of initial group).

When asked to provide an overall rating of the effect of cannabis on their life in the last year, 41% believed it had done them more good than harm, 32% believed the harm and good was about equal, 17% believed the harm outweighed the good and nine percent did not know.

Severity of Dependence Scale (SDS)

The mean SDS score was 4.1 (SD=3.4; range: 0-14) and according to the ROC-adjusted cut-off, 61% of the sample were cannabis dependent in the last year. In the initial interview, 62% of the sample were diagnosed as dependent according to this amended cut-off. There were no gender differences in SDS score (mean of 4.6 for women and 3.7 for men; t_{137}=1.8, p=0.08), and women were no more likely to be dependent than men (63% vs 60%; χ^2, 1df=0.1, p=0.7. Seventeen respondents were dependent on the SDS at the initial interview but not at follow-up, while the opposite was true for another 17 respondents.

Table 5: Proportions (%) meeting a 12-month dependence diagnosis on the short UM-CIDI among the follow-up (n=162) and original (n=200)

	Follow-up Sample			Original Sample
Variable	Total	Men	Women	
Intoxicated at work, school, while caring for children	53	54	52	63
intoxicated in a situation where could be hurt	61	64	56	64
cannabis use caused psychological problems	44	38	52	45
irresistible urge to use	49	47	51	46
spent a lot of time on cannabis	51	48	53	66
often used larger amounts/for longer (n = 161)	51	49	53	54
tolerance	56	53	60	66
Dependent (n = 161) (at least 3 symptoms)	70	70	69	77
mean symptoms	4	4	4	4
range	0-7	0-7	0-7	0-7

* ROC analyses indicated that this was the most appropriate cut-off in this sample (Swift, Hall and Copeland, 1997).

Table 6: Proportion (%) of follow-up (n=162) and original (n=200) samples receiving 12-month ICD-10 dependence diagnosis

	Follow-up Sample			Original Sample
Variable	Total	Men	Women	
strong urge or desire to use cannabis	83	84	81	87
inability to limit/stop	57	53	63	61
withdrawal/withdrawal relief	31	32	29	32
tolerance	51	51	51	62
spent a lot of time/neglected pleasures	53	49	57	61
kept using despite health or psychological problems	46	43	49	52
Dependent (n = 161) (3 or more criteria)*	62	59	65	72
mean criteria met	3	3	3	4
range	0-6	0-6	0-6	0-6

* ROC analyses indicated that this was the most appropriate cut-off in this sample.

Cannabis Use as a Problem

As for the original sample, one third of the follow-up group (33%) believed they had a problem with their cannabis use at least sometimes, while 5% were not sure. However, women were more likely than men to believe their cannabis use was a problem than men (43% vs 26%; χ^2=5.0, p=0.03), whereas there were no gender differences initially. Reasons for these beliefs were largely consistent with those provided one year previously.

Almost half the sample (44%) reported cannabis-related social or legal problems in the last year. These were problems with family (19%), friends (16%), work (12%), study (17%) or the law (4%). Men and women were equally likely to report such a problem (both 44%; χ^2, 1df=0.002, p=0.97)

Health

Slightly less than half the sample believed cannabis had benefited (46%) or harmed their health (45%) in the last year. The major recognised benefit was as a stress reliever and psychological aid (38%). Minorities cited it for analgesia (6%), appetite and nausea (5%), asthma or other respiratory uses (5%) and insomnia (3%). The most commonly recognised ill-effect was on the respiratory system (37%), while a minority cited negative psychological effects (4%).

One in five respondents (21%) had consulted a psychologist or other mental health professional in the last year, while six percent had been admitted to a psychiatric hospital or had been prescribed medication for a psychological condition.

Current psychological well-being in the last 7 days was again assessed by the SCL-90-R, and standardised T-scores were derived from the normative population of adult non-patients (Derogatis, 1994). Male long term users scored more than one standard deviation higher than the mean of the male normative population (n=494) on the anxiety, depression, interpersonal sensitivity, phobic anxiety and psychoticism subscales, and the Global Severity Index (GSI). Females scored more than one standard deviation higher on the interpersonal sensitivity, obsessive compulsive, depression and psychoticism subscales, and the GSI than the female normative sample (n=480).

As for the original sample, the average score on the GSI, which provides a summary measure of the number and intensity of symptoms of distress, was significantly higher among long term cannabis users than the normative sample (mean of 0.6 vs 0.3; t_{1130}=3.9, p<0.001). However, in contrast to the original sample, the profile of scores among the male follow-up group met Derogatis' (1994) definition of "caseness" or positive risk for psychiatric problems requiring intervention.

Treatment Issues

Nearly two thirds of this sample (62%) had attempted to moderate their use in the last year, with the majority doing so unassisted (92% of those who had decreased/stopped). Only eight people had sought assistance to moderate their use in this time. Seven had been to a drug counsellor, residential service or detox,

while only one person had seen a psychiatrist. One third (32%) of the sample had been questioned about their cannabis use by a health professional, such as a doctor, or had discussed their use with a health professional, in the last year.

Agreement Between Measures

Pearson product moment correlations indicated at least moderate agreement between scores on all three dependence instruments (short UM-CIDI and ICD-10 measure: 0.77; short UM-CIDI and SDS: 0.65; ICD-10 measure and SDS: 0.68). These correlations were of much the same order as those among the initial sample.

Agreement between a respondent's diagnosis on the short UM-CIDI and the ICD-10 measure was again moderate to substantial (kappa=0.60). Agreement between the diagnosis on the ICD-10 measure and the SDS (kappa=0.44) and the short UM-CIDI and the SDS (kappa=0.38) was only moderate or fair, although these kappas were an improvement on those calculated for the entire sample at the initial interview. This is possibly because ROC analyses made the level of dependence on the SDS more comparable to the other measures.

As before, compared to the short UM-CIDI (kappa=0.21) and the ICD-10 measure (kappa=0.31), an SDS dependence diagnosis was most in agreement with whether a respondent believed they had a problem with cannabis (kappa=0.42).

Factor Structure of Dependence Instruments

The proposed underlying unidimensionality of the dependence syndrome was examined among the three instruments used to measure dependence: the Ontario Adult Drug Use Questionnaire (ICD-10), the UM-CIDI and the SDS. As with the earlier group, Principal Components Analyses (PCA) were performed on each instrument to identify the linear combination of dependence criteria that would explain the maximum amount of variance in the data. Cronbach's alpha was also determined to measure the internal consistency of each measure of dependence - if these are unidimensional scales the value of alpha should be 0.70 or greater (Strainer & Norman, 1995).

ICD-10

The six criteria comprising the ICD-10 dependence diagnosis were based upon binary variables - that is, the criterion was present or absent for each respondent. Thus, a tetrachoric correlation matrix was calculated which was then submitted to a standard PCA. The analysis produced one component with an eigenvalue greater than 1, accounting for 59% of the total variance. Each criterion had a loading of at least 0.5 on this factor, although the criteria of withdrawal and using cannabis despite problems were negatively correlated with the factor. Withdrawal may have correlated negatively with the other variables because the greater the urge to use, and time spent using, the less time respondents may have spent in withdrawal.

This factor structure contrasts with that found among the initial sample, which was comprised of two uninterpretable principal components. In the earlier analyses withdrawal also had a high negative loading on the first factor, but using cannabis

despite problems had a high positive loading. The Cronbach's alpha among the follow-up sample was sufficient to reflect unidimensionality, whereas this was not the case among the initial sample (0.66).

Short UM-CIDI

Principal components analyses utilising a tetrachoric correlation matrix between the 7 items of this scale yielded two principal components. Orthogonal rotations produced two new PCs, describing 32% and 30% of the total variance, respectively. The first PC comprised items 4 (inability to resist use), 6 (using more than intended) and 7 (tolerance), while the second PC comprised items 1 (use when inappropriate), 2 (use when dangerous) and 3 (use despite psychological problems). Item 5 (spending a lot of time using) loaded almost equally on both. Again, there were negative loadings: item 4 continued to have a high negative loading on the first PC, while item 3 had a negative loading on the second. As for the ICD-10 analysis, these negative loadings reflected these items' negative tetrachoric correlations with all other items except each other.

Unlike the factor solution for the initial sample, which appeared to distinguish items measuring impaired control, use despite psychological consequences and tolerance, from items measuring use in inappropriate or dangerous circumstances, this factor structure was not easily interpretable. Cronbach's alpha was the lowest of all three follow-up dependence measures (0.69), although it was slightly higher among the follow-up group than the original sample (0.62).

SDS

As each of the 5 items on the SDS allowed for four response options, and the responses on each item were approximately normally distributed, the default correlation matrix using Pearson product moment correlations was used. One PC accounting for 64% of the total variance was extracted; all items had positive factor loadings in excess of 0.50 with this component. Cronbach's alpha for the scale was 0.86 indicating good internal reliability. This scale had almost identical psychometric properties among the initial and follow-up groups.

Stability of Use and Dependence

Patterns of frequency and quantity of use (see Table 7) were relatively stable from Interview 1 to Interview 2, as indicated by Pearson correlations (frequency: $r=0.51$, $p<0.0001$; quantity: 0.62, $p<0.0001$).

A similar pattern was evident for dependence, when assessed as the correlation between total dependence scores, and as the odds of being dependent on an instrument at follow-up if a respondent was dependent initially. Dependence was most stable when measured by the SDS, followed by the short UM-CIDI and the ICD-10 measure of dependence. Further, a respondent was approximately 19 times more likely to believe they had a cannabis problem at follow-up if they initially believed this, compared to those who did not.

Longitudinal Analyses

Longitudinal multivariate analyses were conducted to investigate the relationship between respondents' attitudes and behaviours at the initial and follow-up interviews. Specifically, analyses report how variables measured at the initial interview predicted major variables of interest at follow-up. These analyses addressed the question: What was it about respondents at the initial interview that affected their attitudes and behaviour one year later? The variables of interest were quantity of use, severity of dependence, problematic use and psychological distress.

Table 7: Stability of use and dependence measures defined by:- correlations (r) between scores at both interviews (Column 2) and the unadjusted odds of reporting a measure at follow-up if reported initially (Column 3)

Measure	Pearson's r*	Unadjusted OR (95% CI)
Frequency	0.51	N/A
Quantity	0.62	N/A
Short UM-CIDI	0.61	6.7 (3.0, 14.7)
ICD-10 Measure	0.57	5.4 (2.6, 11.4)
SDS	0.71	13.1 (6.1, 28.0)+
Problematic use	N/A	18.6 (7.8, 44.3)

Initial interview: measured as the log (ln) of the number of standard cones consumed per day; follow-up interview: measured as the log (ln) of 1 plus number of standard cones consumed per day
* all p<0.0005
+ OR calculated using cut-offs estimated in ROC analysis (i.e., dependent if scored 3 or more)

Quantity

Quantity of cannabis used at follow-up had a small negative correlation with age of first use (r=-0.19) and severity of UM-CIDI (r=0.21) and ICD-10 (r=0.14) dependence, and a moderate positive correlation with frequency of use (r=0.76). It was most strongly related to the quantity of cannabis used at the initial interview.

Two multiple regression analyses were conducted, containing the age of first use, initial quantity and frequency of use and the two measures of dependence severity. In both cases the final model ($F_{1,158}$=98.2, p<0.0001) included only the quantity of cannabis used at the initial interview (β=0.49, SE=0.05, t=9.9, p<0.0001) as predicting the quantity used a year later. This model accounted for 38% of the variance in outcome.

Severity of dependence

For each dependence measure, the strongest univariate predictor was the score on that same measure one year previously. Age was also consistently related to follow-up dependence, while gender was related only with the severity of SDS dependence. The respondents' length of cannabis use, and quantity and frequency of use at the initial interview also predicted dependence one year later. The number of drug classes a respondent had used was related only to the SDS score.

Multiple linear regressions revealed that after adjusting for age, quantity and frequency of cannabis use, severity of ICD-10 ($F_{1,158}$=75.7, p<0.0001) and UM-CIDI dependence ($F_{1,158}$=89.7, p<0.0001) at follow-up was predicted solely by severity of dependence on the same instrument at the initial interview (ICD dependence: β=0.65, p<0.0001; UM-CIDI dependence:β=0.68, p<0.0001). These models accounted for approximately one third (ICD-10:32%; UM-CIDI: 36%) of the variance in outcome.

After adjusting for age, gender, quantity and frequency of cannabis use, the SDS score at follow-up ($F_{2,159}$=87.9, p<0.0001) was predicted by the SDS score one year prior (β=0.78, p<0.0001) and the number of drug classes the respondent had ever tried at the initial interview (β=-0.25, p=0.01). Interestingly, there was a negative relationship between polydrug use and SDS score, such that those who had used fewer drugs by the initial interview were more concerned about their cannabis use at follow-up.

Problem use

Not surprisingly, univariate analyses showed a strong relationship between the belief that cannabis was a problem at the initial interview and the same belief at follow-up. A dependence diagnosis at initial interview was also a strong predictor of the belief that cannabis was a problem one year later. Females were more likely than males to have rated cannabis a problem at follow-up. While frequency and quantity of cannabis use at the initial interview were related to problem use at follow-up, this relationship did not appear linear. Quantity was subsequently coded as a categorical variable for the multivariate analyses.

For two of the three multivariate analyses (ICD-10: χ^2=61.8, 2df, p<0.0001; SDS: χ^2=59.1, 2df, p<0.0001), problem use at follow-up was predicted by a combination of problem use and dependence at the initial interview (see Table 8). Thus, along with an initial rating of problematic use (ICD-10: χ^2_{WALD}=32.2, 1 df, p<0.0001; SDS: χ^2_{WALD}=24.0, 1 df, p<0.0001), initial ICD-10 (χ^2_{WALD}=6.2, 1 df, p=0.01) and SDS dependence (χ^2_{WALD}=3.6, 1 df, p<0.06) diagnoses predicted subsequent beliefs about use. In the third model (χ^2=43.4, 1df, p<0.0001), a short UM-CIDI diagnosis did not predict problematic use at follow-up, which was predicted only by initial problematic use (χ^2_{WALD}=43.4, p<0.0001).

Psychological distress

There were moderate positive correlations between dependence scores on all three measures and the total score on the Global Severity Index (GSI). There was also a small statistically significant association between the number of drugs used in the last month and psychological well-being. Thus, the greater the number of dependence criteria met and drug classes used, the more likely respondents were to have higher levels of psychological distress.

Three multiple linear regressions were conducted, regressing each of the three cannabis dependence scores, polydrug use in the last month and GSI score on the follow-up GSI score. For two of the three analyses (UM-CIDI: $F_{2,153}$=124.7, p<0.0001; SDS: $F_{2,154}$=124.0, p<0.0001), outcome was predicted by a combination of severity

of short UM-CIDI or SDS dependence and initial psychological status. For the third model ($F_{1,155}$=230.9, p<0.0001), ICD-10 dependence and polydrug use failed to predict outcome, which was associated only with initial GSI scores. The models accounted for between 60% and 62% of the variance in outcome.

Table 8: Predictors of self-reported problem cannabis use at one year follow-up from items assessed at the first interview (n=154 unless specified)

Variable measured at initial interview	% reporting problematic use at follow-up	unadjusted OR	adjusted OR (95% CI)
ICD-10 model			
ICD-10 diagnosis (n=152)	43.5	7.7	5.5 (1.4, 21.3)
problem use	69.6	18.6	13.4 (5.4, 32.8)
UM-CIDI model			
UM-CIDI diagnosis (n=153)	38.6	3.5	N/A
problem use	69.6	18.6	18.6 (7.6, 43.4)
SDS model			
SDS diagnosis	47.9	8.3	3.1 (0.9, 9.8)
problem use	69.6	18.6	11.2 (4.2, 29.1)

DISCUSSION

A respectable 81% of the initial 200 cannabis users were re-interviewed at one year. This group were readily contactable in most cases, and appeared to have fairly stable lifestyles. Younger, polydrug using males were significantly more likely to have dropped out at follow-up. Analyses (not reported here) revealed that differential attrition had no effect on the predictors of the follow-up variables.

Consistent with other research (e.g., Halikas et al, 1984), cannabis use patterns remained fairly stable, with at least moderate correlations between frequency and quantity of use at the two interviews. Further, longitudinal multivariate analyses revealed that after adjusting for confounders, only quantity of cannabis used at the initial interview predicted the quantity used at follow-up. Bachman and colleagues (1997) reported considerable stability in cigarette, alcohol and marijuana use (correlations of approximately 0.9) in late adolescence and early adulthood, which they claim reflects relatively stable individual differences in personality and social environments. Likewise, within the relatively short period assessed here, there was little change in many of the demographic characteristics and drug using contexts of the participants. Stein, Newcomb and Bentler (1987) found that individual stabliity in drug use occurred over the 8 years of their study (from adolescence into young adulthood). Even though the type of specific drug may have varied (for example, cannabis use decreased), they described a "general drug-taking orientation [which] may involve changes in the use of a particular substance over time but only moderate changes in the predilection to use drugs" (p.1101).

Nevertheless, despite this general stability, one in five follow-up participants were consuming cannabis at a level that would have precluded their initial eligibility for the study (less than weekly). The bulk of change had been achieved without professional intervention. It is not clear if this decrease reflects long-term behaviour change, or a shorter cycle of ups and downs in use. Halikas and colleagues (1984) noted a polarisation in cannabis use frequency at their six year follow-up. It is possible that the data reported here reflects the beginning of this process in this group - with half remaining daily users, and an increasing proportion using less than weekly. However, the one year time period may be insufficient to reveal such a trend if this is occurring, particularly given the limited range of changes in behaviour. Further longitudinal data is required to assess the longevity and nature of these changes.

There had been little change in respondents' reasons for, and experiences of, cannabis use, or in the contexts of use. Availability remained stable, while only one in five respondents believed the price had increased. Criminal activity remained centred on "victimless crime", with few receiving police attention related to cannabis use. Alcohol and tobacco remained the most commonly used drugs other than cannabis, and more than half the drinkers continued to drink at hazardous levels. Use of other drugs was uncommon, and this was not surprising given the lack of persistence of illicit drug use found in general population and long-term user samples in this age group (Chen & Kandel, 1995; Halikas et al, 1984).

Despite some movement into and out of dependence, there was little overall change, as reflected in the correlations between total dependence scores, and the odds ratios between diagnoses, at both interviews. Respondents still displayed ambivalence between being diagnosed as dependent and believing use to be a problem, with one third of the sample concerned over their use. Longitudinal analyses confirmed this data, showing the main predictor of dependence on each instrument at follow-up was the corresponding dependence value at the initial interview. In addition to an initial rating of problem use, a dependence diagnosis at the initial interview also predicted self-reported problem use at follow-up. However, given the complexity of the dependence process, the limited predictors identified here would need to be considered with a more complete set of biological, psychological and sociocultural factors in order to fully understand their contribution and interaction (e.g, see Orford, 1990).

Almost half the sample had reported a cannabis-related legal, work, study, or social problem, while one in three believed it had caused them respiratory problems such as a persistent cough or asthmatic symptoms. Although this sample were also regular tobacco smokers, the potential respiratory harm related to cannabis use should not be ignored. Longitudinal research has found a relationship between cannabis smoking, symptoms such as bronchitis, respiratory immunosuppression and possible precursors to malignancy, some of which are magnified among those who also smoke tobacco (Baldwin et al, 1997; Fligiel et al, 1997). Nevertheless, the importance of the positive effects of cannabis, for instance on psychological well-being, should not be under-estimated, when considering the ambivalence that many participants felt about their use.

Principal components analyses again revealed conflicting evidence for a

unidimensional cannabis dependence syndrome. The SDS continued to show good evidence for unidimensionality, consistent with the data collected from the original sample and a sample of long-term users recruited from the NSW North Coast (Swift et al, in press).

However, the ICD-10 measure was now comprised of a single dimension, compared to the two uninterpretable factors evident in the original and North Coast groups. Further, the short UM-CIDI continued to fall out in two dimensions, which were less interpretable among the follow-up group than in the original group interviewed a year prior. When the results of several studies are considered, there is still doubt over the nature of cannabis dependence, compared to drugs such as alcohol, which regularly load on a single dimension (see Swift, Hall and Copeland, 1997).

In summary, this group of long-term users appeared to be "both persistent and flexible" (Halikas et al, 1984) with their cannabis use. Stability was reflected in the strong relationship between patterns of use and dependence over the year, while still allowing for flexibility in, for example, frequency of use. While the time frame investigated here was narrow, it nevertheless allowed some insight into the factors associated with use patterns among a group of cannabis users rarely addressed in the literature. Further interviews are required with this group over several years in order to ascertain the extent and correlates of changes versus the persistence of behaviour, which may assist in our understanding of the experience of long-term use and dependence.

ACKNOWLEDGMENTS

This research was funded by a National Drug Strategy Research Scholarship, Commonwealth Department of Health and Human Services. Robin Room (Addiction Research Foundation, Canada) and Ronald Kessler (Harvard Medical School, USA) kindly gave permission for use of the ICD-10 and short UM-CIDI dependence measures, respectively. Michael Lynskey and Maree Teesson provided valuable assistance with the statistical analyses.

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BRIEF COGNITIVE BEHAVIOURAL INTERVENTIONS FOR CANNABIS DEPENDENCE

Vaughan Rees, Jan Copeland and Wendy Swift

INTRODUCTION

Although cannabis is the most widely use illicit drug, both in Australia (National Drug Household Survey, 1995), and the Western world in general (Donnelly & Hall, 1994), there has been a paucity of information about its long term effects on heavy users. As well as a relative lack of information about the physical or medical consequences of long term cannabis use, there has been little systematic research on the question of cannabis dependence. Possibly as a consequence of the paucity of information on long term cannabis abuse, there has been virtually no formal research investigating best clinical practice models of interventions for cannabis dependence. Certainly, cannabis has traditionally been viewed as less harmful, and the notion of cannabis dependence a far less serious problem, compared to other drugs of dependence such as alcohol or opioids.

However, the cumulative research on the long term effects of heavy cannabis use now suggests that there are certain deleterious medical and psychological sequelae (Hall, Solowij & Lemon, 1994). These harms appear to be comparable to the relative harms of long term alcohol and tobacco use. Recent evidence indicates that long term cannabis use is associated with increased risk of respiratory diseases, subtle cognitive impairment, increased risk of cancers of the aerodigestive tract, reduced motivational and occupational performance, possible birth defects, and potential activation of psychosis in those who are predisposed (Hall, Solowij & Lemon, 1994). Also included among these harms is the potential for the development of physical and psychological dependence. Again, the notion that there may be a cannabis dependence syndrome has only recently been investigated in a systematic manner. Using standard, internationally accepted criteria (such as DSM IV and ICD-10) evidence has been obtained to indicate that long term cannabis use may result in a "classic" pattern of dependence which is similar to that for other major drugs of abuse such as alcohol, nicotine, opioids and cocaine (e.g. Newcombe, 1992; Rounsaville, Bryant, Babor, Kranzler & Kadden, 1993). The major criteria for diagnosing cannabis dependence include the development of tolerance, evidence of withdrawal symptoms upon cessation of use, cannabis taken in larger amounts or for a longer period of time than intended, unsuccessful efforts to cut down, much time spent using or recovering from its effects, neglect of important social, occupational or recreational activities, and continued use despite knowledge of the onset of medical or psychological harms. These DSM IV criteria have been used in recent research at NDARC to detect a cannabis dependence syndrome among long term heavy users in samples from the Sydney area (Swift, Hall & Copeland, 1997), as

well as among the heavy cannabis using communities of the New South Wales far north coast (Didcott, Reilly, Swift & Hall, 1997).

Together with the identification of the cannabis dependence syndrome and better understanding of its attendant harms, there is also recent evidence of steady increases in the number of cannabis users seeking the help of treatment services. The 1995 census of clients of Australian treatment agencies found that persons seeking treatment for cannabis problems had increased by 63% since 1990, and was at its highest level in the most recent survey (Torres, Mattick, Chen & Baillie, 1995). Unfortunately, there has been a traditional lack of effective clinical interventions for cannabis users, possibly because cannabis has been viewed as non-dependence forming, and, relative to some other drugs of abuse, less harmful. Anecdotal evidence from cannabis users seeking help suggests that they are discouraged from attending drug treatment agencies and units, where preference is given to users of so-called "harder" drugs. Some cannabis users have reported attempting to attend meetings of Alcoholics Anonymous or Narcotics Anonymous and are very often disappointed to find that these organisations are not oriented to meet their specific needs. (Although Marijuana Anonymous has an increasing profile in the United States and elsewhere, it still lags behind its better known counterparts in Australia.)

Considering the relatively high prevalence of cannabis use and dependence, the lack of appropriate treatment interventions for cannabis problems leaves a serious gap in our efforts to reduce and overcome drug-related problems in the community. While a range of treatment interventions for cannabis cessation have been implemented over the past two decades, there has been very little systematic research on developing a best practice model for the treatment of cannabis dependence. Previous efforts to treat cannabis dependence that have been reported in the international literature include a trial of aversion therapy in Nigeria (Morakinyo, 1983), general supportive counselling in Sweden (Tunving, Lundquist & Eriksson, 1988), and supportive-expressive dynamic psychotherapy in Australia (Grenyer, Luborsky & Solowij, 1995). While these approaches have yielded only modest outcomes, the techniques used in the Swedish and Australian studies are still used in small clinical programs in each of those countries.

More recently, efforts on a larger scale have seen the introduction of cognitive-behavioural therapeutic techniques in the treatment of cannabis dependence (e.g. Roffman, Klepsch, Wertz, Simpson & Stephens, 1993; Stephens, Roffman & Simpson, 1994). Cognitive behaviour therapy (CBT) has been demonstrated to have efficacy that is at least equipotent with a range of comparable treatment modalities (Andrews, 1991; Barlow & Hofmann, 1997), including treatment for abuse and dependence of alcohol and other drugs (Mattick & Jarvis, 1993; Project MATCH Research Group, 1997). The major aim of CBT is to assist clients to manage or overcome the primary problem, ie. repeated drug use, by developing and using specific skills or techniques. Cognitive techniques assist clients in changing certain thought processes that underlie drug dependence, such as control of urges and cravings, improving confidence in resisting drug use, challenging outcome expectancies or beliefs regarding the perceived benefits of drug use, and learning control over irrational or intrusive thoughts that trigger negative emotions and

promote drug use. Behavioural techniques generally involve self monitoring of drug use behaviour and its antecedent mood and craving states, developing alternative activities to drug use, and the adoption of effective coping strategies that can be used when threatened by a high risk, or potential relapse, situation. Together, cognitive and behavioural techniques provide a powerful "package" for assisting clients to quit drug use, as well as maintaining abstinence in the longer term by preventing relapse (Jarvis, Tebbutt & Mattick, 1995; Marlatt & Gordon, 1985).

Recent research in the United States by Roffman and Stephens and their colleagues has provided the first demonstrations of the efficacy of CBT interventions in the treatment of cannabis dependence. The basis for the CBT interventions of Roffman et al. was guided by Marlatt and Gordon's (1985) relapse prevention model. Roffman and colleagues used a group-based CBT approach, and compared a longer (14 weekly sessions) intervention with a brief (2 sessions) intervention. Both interventions were effective in assisting clients to reduce frequency of smoking or to abstain from cannabis, compared with a no-treatment control group, over a twelve month period. While the results have been generally modest (approximately one fifth to one third of clients abstinent at 12 months), these findings are in line with similar research on outpatient treatment for alcohol, opioid and nicotine dependence (see Mattick & Baillie, 1992; Mattick & Jarvis, 1993). Thus, this work constitutes an important advance in demonstrating the efficacy of an existing therapeutic modality in the new problem of treatment of cannabis dependence.

The present research was developed in order to meet the demands of the increasing need for effective interventions for cannabis dependence in an Australian context. Our challenge is to develop an intervention that is brief and efficacious, as well as being appealing to prospective clients. CBT provides promise on all of these counts: it is by nature a briefer form of intervention, and is consistently shown to be of at least equal efficacy to other effective treatment options. Thus, a CBT program of six sessions was developed to assist clients in quitting cannabis use. A brief intervention of one session was also developed in order to test whether a minimal intervention using CBT techniques would also be effective. There is now a substantial literature from the alcohol and tobacco treatment fields that suggests that brief interventions of one session can have considerable impact on an individual's substance use, and compare favourably with multiple session interventions (e.g. Heather, 1989).

The present study, which is still in progress, is a randomised controlled trial of two brief CBT interventions for treating cannabis dependence. The study aims to test the efficacy of a six-session CBT program against a single-session intervention. Both interventions are designed for delivery on an individual basis, thus allowing a greater capacity for tailoring the components of the treatment package to the individual's needs. Individuals will be randomly allocated to one of the treatment interventions, or a no-treatment control group. Outcome will be determined by smoking status at a point six months following the end of treatment, as well as reductions in: level of cannabis use (self-report and urinalysis); severity of dependence; global cannabis-related problems; and adverse psychological symptoms. Changes in the two treatment groups will be compared with the control group, who are placed on a waiting list for the six month period prior to the follow up interview.

METHOD

This section describes the design, study procedure and content of the treatment interventions of the research in progress.

Outline of Study Design and Procedure

Study participants are randomly allocated to one of three research groups: a six session CBT program, a single session brief intervention, or a six month "waiting list" control group.

Participants were recruited via several sources. Most were recruited through advertisements in local newspapers or by publicity generated by radio and newspaper interviews with the trial coordinator. Some clients were referred by drug and alcohol treatment units or agencies who were not currently providing treatment for cannabis dependence. Further referrals were received from the Alcohol and Drug Information Service (ADIS) - a 24 hr telephone advice and referral service.

Prospective clients were screened for suitability via a telephone interview. General details about the program were provided to the client at this time, including the nature of the program as a research study, information about the CBT method, and the chance of receiving either six sessions, one session or placement on a waiting list. Virtually all clients were very anxious to start treatment as soon as possible, and were not discouraged by the possibility of having to wait for a six month period before starting. In reality, the current program represented the only option for specialist treatment for their cannabis problem, and the vast majority of clients were willing to wait, if necessary, in order to get the help they needed.

Exclusion Criteria

Prospective clients who were willing to participate in the research study were screened against key exclusion criteria. Clients were excluded if they reported alcohol consumption at a problematic level (defined as having an AUDIT score of 15 or greater), regular (i.e. weekly) use of other substances (excluding nicotine), or a concurrent major psychological disorder. Some clients reported having experienced symptoms of depression or anxiety in the past year and a small proportion (< 10%) reported having experienced symptoms of cannabis-induced psychosis in the past year. Participants were excluded from the study only of the problem was current, and threatened their likelihood of making successful changes to their cannabis use. Persons who had received treatment for cannabis dependence in the previous three months were also excluded, owing to the potential contamination of the present treatment interventions from other recent interventions.

Inclusion Criteria

Individuals who desired formal assistance in quitting smoking cannabis and were ready to make changes were sought for inclusion in the study. Inclusion criteria required that participants met DSM IV diagnosis for cannabis dependence in the previous 12 months, and had been smoking on a regular basis for at least five years.

Thus, cannabis was the primary drug of abuse for participants, as individuals with problematic use of other substances were excluded. Participants were required to be 18 years of age or older and fluent in written and spoken English.

Assessment

Participants who met inclusion criteria were invited to attend an initial session for assessment and allocation to one of the three research groups. The assessment consisted of a specially designed structured clinical interview. Parts of the interview were based on a version of a structured interview used in earlier cannabis research at NDARC (Swift, Copeland & Hall, 1997). Information about subject demographics, health, family history, drug use history, nicotine dependence, history and pattern of cannabis use, legal issues, past treatment experiences and efforts to cut down or quit, and stage of change (Proschaska & DiClemente, 1986) was obtained. In addition, the following structured interviews were administered for diagnosis of cannabis dependence: CIDI (Composite International Diagnostic Interview, version 2.1, for DSM IV diagnosis); University of Michigan CIDI (UM-CIDI: a brief version of the full CIDI); the Ontario Questionnaire (for ICD-10 diagnosis; Adlaf, Ivis & Smart, 1994), and the Severity of Dependence Scale (Gossop, Griffiths, Powis & Strang, 1992). Clients self-completed the Beck Depression Inventory (BDI; Beck & Steer, 1987), the State-Trait Anxiety Inventory (STAI; Spielberger, 1968); and the Symptom Checklist 90-R (SCL-90-R; Derogatis, 1994).

Two instruments pertaining to aspects of cannabis use were designed especially for the present research: a *cannabis use self efficacy scale,* designed to measure an individual's confidence in resisting smoking cannabis in a wide range of high risk situations; and a *global cannabis problems scale,* which assesses problems arising from cannabis use including medical, social, psychological, occupational, risky behaviour and relationships towards spouse and children.

The assessment required a whole session of up to 90 min. Before commencing, participants were required to sign an informed consent form as approved by the University of New South Wales Committee for Experiments Involving Human Subjects. As well as obtaining assessment data, time was allocated for discussing the nature of the research study and the methods involved in the treatment interventions. The aim of this first meeting was to fully inform and satisfy clients about the content of the program, so that they were clear about what to expect from the treatment intervention. A urine specimen was also obtained in this session. At the end of the session, participants were required to draw from a large box an envelope, which indicated which treatment group the client was to be allocated to.

Treatment Interventions

An outline of the two treatment interventions used in the present study will be given here. Both CBT interventions deal with the person's thoughts, feelings and behaviours that are connected with heavy cannabis smoking. The therapy focuses on the context in which the individual's smoking typically occurs and allows clients to develop skills or strategies for changing the problematic thoughts and behaviours

that perpetuate cannabis dependence. These cognitive-behavioural techniques are designed to enable permanent change.

1) Brief Intervention

The brief intervention of one session was designed to assist the client to plan and develop a complete set of strategies for quitting cannabis use maintaining the changes in the long term. Relevant aspects of the assessment session were incorporated into this session, with feedback provided about the client's level of dependence, identification of his or her most relevant personal triggers and a review of the problems encountered over the past 12 months of cannabis use. The instruments developed for this study, the cannabis self-efficacy scale, and the global cannabis problems questionnaire, were used for the purpose of providing clients with feedback about respective those aspects of his or her cannabis smoking profile. Information was also given about the known harms associated with long term cannabis use, and these issues, as well as the client's own concerns about long term smoking, were discussed.

The session involved elements of a motivational interviewing technique (Miller & Rollnick, 1991), which was intended to assist the client in making the necessary cognitive preparations for quitting smoking. The main elements of the motivational enhancement technique used at this point were removal of potential barriers to change (both cognitive and environmental) and identifying motives for wanting to quit. Clients were assisted in exploring the pros and cons of cannabis use in order to reach a decisional or motivational balance, and were helped in resolving the problems associated with the perceived need for, or benefits of using, cannabis. Clients were also assisted with identifying social support systems, and exploring and setting short and long term goals. These goals pertained both to immediate plans for cannabis cessation as well as broader lifestyle and personal issues that could assist the transition from a lifestyle heavily based on drug use.

In collaboration with the client, a set of key personal strategies or techniques for quitting were developed. These involved negotiating a quit date, deciding how to cut down before quitting, and adoption of alternative activities for times of highest risk. Clients were instructed in urge management techniques and were educated about potential withdrawal symptoms. Practical cognitive and behavioural techniques for managing withdrawal were also discussed. Longer term strategies for the maintenance of abstinence, such as behavioural self monitoring of cannabis use, cravings and moods, and appropriate strategies for the management of negative moods and high risk situations were also addressed.

Clients were given a booklet to keep, which outlined the general details of the session and provided a resource for future reference. This was intended to ensure that clients continued to work on their quit strategy after leaving the brief intervention session.

2) Six-session CBT program

The aim of the six session CBT program was to equip clients with the skills necessary to quit smoking cannabis, as well as to maintain the changes in the longer term. Thus, the techniques involved in the intervention included strategies not only for modifying cannabis use, but also to enhance the development of a drug-free lifestyle and adopt personal skills that may assist in the prevention of relapse. A session-by-session outline of the program will be described here.

Session 1: Introduction to motivational enhancement training

The first session was similar in content to the single session brief intervention. The session commenced with a discussion of the previous week's assessment including results of cannabis dependence diagnosis, personal triggers and high risk situations and key problems arising from cannabis use in the past year. A motivational interview component was also included, to enhance client motivation, clear any blocks or obstacle for making changes and identifying short and long goals for treatment. Clients were instructed in the use of behavioural self management, which required daily monitoring of cannabis use, ratings of strength of urges to smoke, description of accompanying moods or emotions, and documentation of the physical situation in which smoking or craving occurred. This was designed to assist clients in understanding some of the situational factors that accompany smoking. so that more effective strategies for managing urges and their triggers (particularly negative moods) could be developed in the coming weeks. Motivational enhancement therapy was used to prepare the client for quitting and ensure that he or she was in the "action" stage of behavioural change (Proschaska & DiClemente, 1986). Finally, a quit date was negotiated, ideally for some time in the week following the second session.

Session 2: Getting organised to quit

The session commenced with a review of the previous week's progress. The client's self monitoring forms were checked and progress in cutting down smoking was discussed. The aim of the second session was to assist the client in quitting some time during the next seven days.

The major focus of this session therefore, was an introduction to coping with urges & handling triggers. Urges are generally considered the greatest challenge, both for individuals preparing to quit as well as the therapist facilitating the changes (Marlatt & Gordon, 1985). The client was instructed in key urge management techniques such as urge surfing (riding out the urge wave - waiting for the worst to pass within 20 - 30 min), distracting and delaying smoking, learning to decatastrophise or re-label symptoms of distress, and learning to challenge irrational expectancies or beliefs about the positive effects of smoking. The nature of withdrawal symptoms was also discussed, and key strategies for minimising the discomfort of symptoms such as insomnia, night sweats, restlessness and irritability, and change in appetite were planned.

This session also involved a review of personal high risk situations, and developed a list of possible strategies for managing those situations. Some of these strategies involved planning alternative activities and preparing mentally for the effect of personally potent triggers. Finally, social support systems were identified, so that appropriate help was available to the client during the first difficult week of quitting. There was also an option in this session to help the client in developing drug refusal skills. Although highly useful, most clients did not require this part of the intervention, as they were clearly highly socially competent and able to refuse a smoke or engage in some appropriate alternative behaviour. For those who required assistance with smoking refusal skills, simple role play exercises were used.

Session 3: Focus on continuing progress & cognitive aspects of quitting

The third session commenced with a review of the previous week's progress, including the craving diary and examination of any slips or lapses. Any problem areas that had been experienced were identified, including problems with high risk situations. Problems with withdrawal symptoms were addressed, including the type and severity and the client's success in managing tem using behavioural strategies. If needed, time was spent fine-tuning the relevant strategies acquired up to this point, and alternative strategies discussed where recurrent problems had been experienced.

The main focus of the third session was the technique of "cognitive restructuring", or learning how to think differently. This cognitive technique was developed primarily by US therapists Aaron Beck and Albert Ellis, and assists clients in overcoming negative moods or emotions by learning manage the negative thoughts which underpin them.

Clients are introduced to the idea that negative thoughts or beliefs about oneself or the world are the basis for experiencing negative feelings or emotions. The "ABC" conception is used to communicate the basis for the technique to the client. That is, feelings or emotions are triggered not by events or the things that happen to us, but by our interpretation of that event. An Action or event, "A", leads to a Belief or interpretation about that event,. "B". When the belief or interpretation is a negative thought, as is often the case among pessimists or those with a negative attributional style, a negative feeling or emotion will quickly arise, "C", or Consequence. Thus, negative feelings or emotions are simply reflections of negative thoughts. Clients are instructed in how to manage and eliminate negative thinking, using a set of key thought challenging and stopping techniques. This is useful for helping clients to manage their thoughts more effectively. This seems to be an important issue for many long term cannabis users who use cannabis for managing their thoughts or guiding the flow of their thoughts. Typically, without cannabis, many long term smokers become distressed by frequent negative, intrusive and irrational thoughts, and have few if any coping skills for managing those thoughts.

Cognitive restructuring may also help clients to manage negative moods more effectively, therefore avoiding a major class of relapse trigger. As urges are closely related to negative thoughts and moods, better control over this aspect of cognitive function may help with urge management skills.

Clients are also introduced to SIDS (seemingly irrelevant decisions), first described by Marlatt and Gordon (1985). This simply refers to clients becoming more aware of the implications of seemingly inconsequential actions on the likelihood of using drugs. Because much of an individual's drug use has, over many years of practice, become overlearned and automatic, smoking can occur without a any real higher conscious effort. Some individuals find themselves repeating old behavioural patterns without realising that they are placing themselves in jeopardy of a high risk situation. Awareness of old behavioural patterns, and their implications for resulting in drug use are therefore examined.

Session 4: Cognitive skills enhancement & introduction to coping skills training

The primary aim of this session is to further develop cognitive skills and techniques, and to introduce clients to personal coping skills that will assist in the maintenance of a drug-free lifestyle.

The session begins with exploring the role of drug-related expectancies and beliefs. Most individuals have certain key beliefs about the positive effects cannabis has for them, from enhancing sleep, to relaxing and unwinding, and boosting energy or appetite. Often these expectancies are irrational, or can be looked at in more than one way. The aim is to help the client to explore the basis for many of his or her personal expectancies and adopt techniques for challenging those expectancies.

The session also helps the client to explore positive alternatives to using cannabis. Other activities, so-called "positive addictions," such as sports, hobbies, music and artistic pursuits are explored to help the client to make the shift into enjoying key lifestyle activities without drug use.

A range of other skills may be introduced at this point, depending on what the individual client would most benefit from. These include:

- Coping skills training / problem solving techniques
- CBT for sleep disorders (review of problem, key strategies, sleep hygiene, etc)
- Relaxation training (progressive muscle relaxation). Review of uses

The aim is to select, in consultation with the client, the technique that will be of most benefit. The selected option can be then worked upon in this session, and continued the following week. The aim of introducing these skills is to boost the client's own personal life skills, and to promote a drug-free lifestyle by reducing the client's need for cannabis to achieve certain results, such as managing stress, sleeping better, or being able to unwind and relax.

Session 5: Reviewing and consolidating. New skills if required

The fifth session is designed to help the client to consolidate the skills already acquired and to overcome any persisting problems encountered in previous weeks. Thus, this session allows re-examining and continuing work on any of the techniques introduced already.

Some clients will benefit from acquiring further strategies, based on interpersonal coping skills training. These skills are very effective for equipping clients for maintaining changes in the long term. The therapist can select from the following skills-based training techniques, based on the client's preference and mutually perceived need:

- Assertiveness skills
- Communication skills
- Stress/anger management

Like all of the other skills training techniques, the client must be encouraged to set aside regular time to practice the new skills. Practice should occur initially in a quiet, safe place, and gradually increase the difficulty level to situations of greater challenge. The client should be encouraged to persevere until he or she has attained a satisfactory level of mastery over the skill.

Session 6: Relapse prevention and lifestyle modification

The final session aims to help clients to learn relapse prevention techniques and maintain the changes already acquired through treatment. The relapse prevention component is based on Marlatt and Gordon's (1985) model. The techniques introduced here are intended to allow a natural and effective way of concluding the treatment program. The general outline of this session is as follows:

The client should be encouraged to identify plans for the future. This may involve not just intentions regarding abstaining from smoking, but also medium and long term plans for improving lifestyle and setting life goals. Setting the changes in cannabis use within broader context of lifestyle factors will be more likely to result in better maintenance of quitting smoking.

This session also allows an opportunity to identify any continuing or recurring problems and allow attempts at their resolution. It may be an instructive exercise to let the client work through the key steps for problem solving while working on a real life problem.

This session also allows a final chance to dealing with any continuing problems with smoking cessation, such as any slips or lapses that may have occurred. The SIDS effects can also be examined to see whether the client has been in jeopardy of making this error. A planned emergency drill for managing any future slips or lapses is an important part of preventing relapse in the future. Therefore, some time is taken to prepare the client for any unforseen, future crises.

Finally, the client should be guided through an overview of role of cannabis cessation within his or her whole lifestyle. Success in quitting drug use should go together with other positive lifestyle decisions such as balancing diet, exercise, personal fulfilment, recreation and so on. Possible interesting and exciting non-drug activities should be explored with the client. The client's personal aims and ambitions for the future should be compared to the client's initial plans and goals that were discussed in Session 1. There is usually a significant change in goals and

aspirations across the duration of the program, especially as the client increases in self confidence and esteem. Looking to the future is the perfect way of concluding the program.

RESULTS AND DISCUSSION

The present study is a work in progress and so final results are not yet available. At the present stage, over 100 clients have been assessed and provided with either one or six sessions of CBT, or placed on a six month waiting list. Follow up interviews are currently taking place for those clients who have reached the six month time lapse since concluding treatment. Clients on the waiting list who have completed the follow-up interview are being invited to commence the program, and are given the option of receiving either one or six sessions of CBT. Observing client's choice of length of treatment will provide us with more information about the attractiveness of the interventions on offer.

At this point in the research, the full set of final outcome data are not available. Analyses of treatment outcome will not be undertaken until all of the follow-up data are collected, which is estimated for the middle of 1998. In the meantime, we intend to work on investigating the assessment data, to get a detailed picture of the characteristics of the clients who have sought treatment in this program. These client characteristics can be compared to non-treatment, community samples from Sydney and the NSW far north coast, owing to sections of the assessment interview being common to all of these studies. A small amount of preliminary data from a sub-sample of the first 100 clients to commence the program are presented below.

Other analyses to come from the present study, before the final outcome data are collected, include work on the reliability and validity of the two cannabis assessment instruments: self-efficacy and global cannabis-related problems scales. Both of these instruments represent a new contribution to methods for assessing aspects of cannabis smoking patterns.

Client Characteristics

The total N for the sample is expected to be 240 (80 participants in each of the six-session, one-session, and no-treatment control groups). Data for the first 100 clients assessed are available at this point and so will be reported here.

Clients' mean age is 33.2 (range 19 - 51). There are 67 males to 33 females. The percentage of clients in full-time employment is 50%, with 16% part-time, 15% self-employed and 12% unemployed. (The remainder are students and persons engaged in home duties; some clients belong to more than one category, ie. study and work part-time.)

Their mean AUDIT (Alcohol Use Disorders Identification Test) score was 6.3 (SD = 3.6), where a cutoff of 8 is used to indicate problem drinking status (Saunders & Aslant, 1988).

Fifty percent of the sample reported smoking cigarettes. The mean number of drugs ever used by clients was 5.2, including alcohol and tobacco. Of interest is the observation that 50% of the sample have tried heroin on at least one occasion, but have not continued to do so. The mean number of drugs used in the past 30 days was 2.4, again which includes cannabis, alcohol and tobacco. The mean age at which cannabis was first used was 15.8 years (range 8 - 23 years). The mean number of cones (ie. water pipe) smoked per day was 10.2 (range = 0.1 - 60). Clients reported spending a median amount of $105 each time they purchased a quantity of cannabis, and the median quantity bought was 7 g (quarter ounce). Clients estimated spending approximately 15% of their weekly income on cannabis (range 0 - 90%).

While a range of dependence data and other assessment details were obtained, only a brief version will be reported here. The mean Severity of Dependence Scale (SDS) score was 9.4 (3 - 15), which is well above the proposed cutoff of 4 for diagnosis of dependence.

The sample were relatively free of major criminal problems: only 16% had a previous conviction for a crime involving cannabis (including possession, cultivating, dealing or property crime).

Finally, 38% of the sample of 100 clients had previously sought professional assistance in quitting cannabis, although virtually all of these reported that they were not satisfied with the help that they had received. The most common form of help sought had been consulting a general medical practitioner. Most clients had indicated that they had experienced great difficulty in accessing an appropriate clinical service for helping them to quit smoking cannabis. While their local GP was the most convenient and logical first option, many found that their GP was unable to help, and found few, if any, alternative sources for referral.

Future progress of this research

The present study aims to assess and commence in treatment the last clients by February, 1998, and perform corresponding follow ups by August, 1998. Thus, final outcome data will be available for analysis at this time, and the final results of the research will be available toward the end of 1998. The therapist manuals for the treatment interventions will be published and thus made available to clinicians who are interested in working with cannabis users and would like to use this intervention for cannabis dependence. The brief intervention booklet will also be available in published form, for use as a formal brief intervention with a therapist, or for use as a self-help resource.

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