THE NATURE OF THE AMPHETAMINE DEPENDENCE SYNDROME: APPETITIVE OR AVERSIVE MOTIVATION?

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Libby Topp[1,2], Richard P. Mattick[1] &
Peter F. Lovibond[2]

National Drug and Alcohol Research Centre[1]
& School of Psychology[2],
University of New South Wales, Sydney.

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TABLE OF CONTENTS

LOCATION OF TABLES

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SUMMARY

The concept of the "dependence syndrome", as proposed by Edwards and Gross, originally hypothesised only for alcoholism, was broadened to apply to other psychoactive substances following changes in expert opinion regarding the nature of dependence. The drug dependence syndrome reduced the traditional emphasis on tolerance and withdrawal, and attached greater importance to symptoms of a compulsion to use, a narrowing of the drug-using repertoire, rapid reinstatement of dependence after abstinence, and the high salience of drug use in the user's life.

While current psychiatric taxonomies recognise amphetamine dependence, its existence is quite contentious, and little research has examined the applicability of the dependence notions to this drug. Of the limited research available pertaining to this issue, the most informative has concentrated on amphetamine withdrawal and withdrawal relief drug-taking as hallmarks of amphetamine dependence. These notions fit well with a drug that produces a clearly defined, physiologically based withdrawal syndrome, such as the opiates, but it was feared such symptoms may be less relevant to a drug such as amphetamine, for which the withdrawal syndrome is somewhat more nebulous. In such cases, it is reasonable to hypothesise that the positively reinforcing aspects of the drug, as well as its negative reinforcement capacity, are both important factors in dependence.

In the present study, 132 regular amphetamine users, dependent by DSM-III-R criteria, were administered a structured interview schedule in order to determine, firstly, whether there *is* an amphetamine dependence syndrome, and secondly, to begin explicating what the dimensions underlying such a syndrome might be, and in particular, the relative contributions of appetitive and aversive motivation in heavy amphetamine use.

A number of different questionnaires were administered and different analyses performed. However, a consistent picture emerged: clear evidence for a continuum of dependence was obtained, with many theoretically relevant differences between those individuals diagnosed as *severely* and *mild/moderately* dependent by DSM-III-R criteria; and more dependent users were distinguished from their less dependent counterparts by items which assessed the negative reinforcement capacity of amphetamine. That is, as the use pattern moves from recreational to heavy, the euphoric, energizing, confidence building effects of the drug remain important in motivating use. However, in heavy, more dependent users, other motivations, involving the drug's capacity to remove some aversive physical or emotional state, are also important. These results have implications for the current debate on the status of amphetamine dependence, as well as for stimulating research into appropriate interventions for amphetamine dependence treatment.

1.0 INTRODUCTION

1.1 The dependence syndrome and amphetamine

The concept of the "dependence syndrome", as proposed by Edwards and Gross[1], originally hypothesised only for alcoholism, was broadened to apply to other psychoactive substances following changes in expert opinion regarding the nature of dependence[2]. The drug dependence syndrome reduced the traditional emphasis on tolerance and withdrawal, and attached greater importance to symptoms of a compulsion to use, a narrowing of the drug-using repertoire, rapid reinstatement of dependence after abstinence, and the high salience of drug use in the user's life.

The notion of a dependence syndrome as elucidated by Edwards *et al.*[2] contains two major testable postulates:

(1) the coherence of a core set of physiological signs, behavioural indicators and cognitive symptoms that are arrayed along a continuum of severity. That is, certain elements cluster to form a single dimension of dependence, and with increasing severity, a substance user manifests more of these elements.

(2) the relative independence of syndrome severity from psychosocial consequences.

This new conception influenced the development of the notion of Substance Dependence in DSM-III-R[3] and DSM-IV[4], in which greater emphasis was placed on continued use of a drug in spite of its adverse effects. However, as other authors[5,6] have commented, little research has examined the applicability of these notions to a wider range of substances, including the amphetamines.

This is an unfortunate state of affairs, particularly in Australia, where recent household surveys have all shown that amphetamines are the most widely used of the illicit drugs after cannabis[7,8], and where the number of people presenting for treatment with a primary amphetamine problem has doubled in recent years[9]. There is little evidence pertaining to the existence of an amphetamine dependence syndrome, and even less explication of the factors underlying such a syndrome. This has been of particular concern in recent times, as the maintenance of chronic psychostimulant users on amphetamine or cocaine has received renewed attention as a possible treatment approach[10]. Many argue that amphetamine substitution is inappropriate because users are not generally physically dependent[11,12]. Others suggest that the argument that there is not a clearly defined amphetamine dependence syndrome is unconvincing, because psychological dependence and amphetamine induced neurotransmitter disturbances are evidence for dependency[13].

Limited evidence for amphetamine dependence is available from studies of the validity of the diagnostic criteria for Substance Dependence in the various psychiatric classificatory systems. Kosten *et al.*[14] examined the applicability of the dependence syndrome to a wide range of drugs, including stimulants. Ten items assessing the

DSM-III-R dependence syndrome were factor analysed. Cronbach's alpha for the stimulant items (n=33) indicated good internal consistency, and application of Guttman scaling techniques suggested that the items formed a good approximation of a unidimensional scale. That is, higher scores on the stimulant dependence scale were consistent with more severe dependence. However, a Principal Components analysis of the stimulant items suggested that there seemed to be two independent dimensions of stimulant dependence, which they labelled *compulsion* and *problematic use.* Thus, the study failed to support the hypothesis that the dependence syndrome is unidimensional. Kosten *et al.* concluded that the status of the dependence syndrome for stimulants was uncertain, and that more research with greater sample sizes was required.

Hasin *et al.*[15] administered the Diagnostic Interview Schedule (DIS), which operationalizes DSM-III, to patients on an alcohol rehabilitation ward, in order to examine the applicability of the dependence syndrome to drugs other than alcohol. Five DIS questions were considered to tap aspects of the dependence syndrome: (a) feeling dependent on the drug; (b) unsuccessful attempts to control drug use ie. impaired control; (c) tolerance; (d) withdrawal; and (e) two or more weeks of daily use of the drug. For the DIS stimulant questions (n=103), internal consistency was acceptable, and one factor emerged in the Principal Components Analysis. Scores on scales measuring problems related to drug use were also included in the analysis, and loaded significantly on to the principal component. Thus, this study provides support for the unidimensionality of the dependence syndrome, but not for its independence from drug-related problems, as proposed by Edwards *et al.*[2]

Woody *et al.*[5] examined the applicability and clinical utility of the dependence syndrome across a wide range of substances, including amphetamine, as part of the DSM-IV field trials. It was shown that lower levels of amphetamine use were correlated with lower levels of dependence; that 56.5% of the 281 subjects who used amphetamines did not meet the criteria for dependence; and that two-thirds of those who *did* meet dependence criteria, were in the low-moderate severity range. In short, compared to cocaine and heroin, amphetamine was much less likely to be associated with dependence, which is somewhat at odds with the notion that amphetamine has a relatively high abuse liability[16,17]. It might be expected that a drug with higher abuse liability would be used more often than other substances, and therefore, would be more strongly associated with dependence.

1.2 Measurement of amphetamine dependence

Churchill *et al.*[18] developed a measure of the severity of amphetamine dependence, closely related to the Severity of Opiate Dependence Questionnaire (SODQ[19]), which they called the Severity of Amphetamine Dependence Questionnaire (SAmDQ). The SODQ contains items addressing the demographic characteristics of drug consumption, as well as items related to four aspects of the dependence syndrome: *physical aspects of withdrawal; affective aspects of withdrawal; withdrawal relief drug-taking;* and *rapidity of reinstatement* after a period of abstinence. Single items also relate to the notions of *narrowing of drug-use repertoire* and *tolerance*[1]. Churchill *et al.*[18] adapted the dependence questionnaire format used in the SODQ to the measurement of

amphetamine dependence. This adaptation involved: (1) references to opiates in the SODQ were changed to refer to amphetamines; and (2) five additional items referring to the depression and lethargy symptoms of amphetamine withdrawal were added.

Subjects presenting for treatment for amphetamine dependence were administered the SAmDQ, along with the 5-item Severity of Dependence Scale (SDS[20]) which assesses psychological preoccupation with the drug. Factor analyses of items from the questionnaire found that two factors emerged, one consisting of items in the *physical* and *affective withdrawal* sections, and the other comprising the items from the *withdrawal relief* section. In general, findings from the structural analyses of the SAmDQ were consistent with those reported previously for the SODQ, and the authors cautiously interpreted this consistency as support for the notion that there *is* an amphetamine dependence syndrome, and that it may be quite similar to the opiate dependence syndrome. However, they also emphasised the need for further empirical evaluation of the structure of the dependence construct before the SAmDQ could be applied in a clinical setting.

In the context of the present study, there were concerns that the SODQ might be an inappropriate instrument for the measurement of amphetamine dependence, because, while it is accepted that there is a physiologically based, clearly defined withdrawal syndrome for the opiates, it is not yet established that an analogous syndrome exists for the amphetamines[21], nor that the characteristics of amphetamine withdrawal are similar to those of opiate withdrawal. Due to its reliance on withdrawal-related items, it seems reasonable to assume that there might be difficulties in adapting the SODQ to the measurement of dependence upon drugs which do not produce a clearly defined withdrawal syndrome, such as amphetamine[20].

1.3 Theoretical considerations

The underlying assumption of a questionnaire which concentrates on withdrawal and withdrawal relief drug-taking (the readministration of the drug to avoid or escape its withdrawal symptoms), is that it is the negative reinforcement capacity of the drug that is the important factor in motivating use. For theorists such as Wise[22], a drug can be classified as addictive to the extent that it serves as a reinforcer. There are two classes of reinforcement: **positive reinforcement** is produced by a stimulus that brings pleasure or euphoria to a subject already in a normal mood state, and the motivation to approach such a stimulus is referred to as **appetitive motivation**. **Negative reinforcement** is produced by a stimulus that terminates distress or dysphoria, returning the subject to or towards a normal mood state, and the motivation to approach such a stimulus is referred to as **aversive motivation**. It has long been argued that the ascending dopaminergic systems of the brain underlie positive reinforcement, and the ability of stimulants such as amphetamine to increase synaptic DA concentrations within these systems, imbues the drugs with their positive reinforcement capacity. Whereas traditional accounts of problematic drug use have tended to concentrate on the aversive consequences of terminating drug taking ie. withdrawal[23], others[24] argue that compulsive drug use is maintained by appetitive motivational processes, or the generation of positively affective motivational states. Given arguments such as these, which are consistent with the gradual replacement of *drive reduction* theories of

motivation with those concerning the role of *incentive stimuli* in generating motivational states[24], it was considered unfortunate that the only questionnaire designed to measure severity of amphetamine dependence, was concerned only with the negative reinforcement capacity of the drug. A huge literature, reviewed elsewhere[25], indicates that stimulant drugs are readily self-administered by laboratory animals, and that their long-term use can be maintained in the absence of aversive withdrawal symptoms or physical dependence. Therefore, in examining the existence and the nature of the amphetamine dependence, this study makes a concerted attempt to assess both the appetitive and the aversive motivation to use the drug.

1.4 Aims of the present study

In short, although current psychiatric taxonomies (DSM-III-R[3], DSM-IV[4] and ICD-10[26]) recognise amphetamine dependence, little research has examined the existence of such a syndrome, and the available research pertaining to this issue has produced inconsistent results. The aim of the present study, therefore, was to interview a sample of current amphetamine users, dependent by DSM-III-R criteria, about their patterns of use, reasons for use, and amphetamine related problems, in order to determine firstly, whether there *is* an amphetamine dependence syndrome, and secondly, to begin explication of the dimensions underlying the syndrome, in particular, the relative contributions of appetitive and aversive motivation in heavy amphetamine use.

2.0 METHOD

2.1 Procedure

The sample comprised 132 regular amphetamine users recruited in 1995 through advertisements in entertainment magazines, local newspapers, needle exchanges and through word of mouth. All subjects were volunteers who were reimbursed A$30 for their participation.

Subjects contacted the researchers by telephone, and were screened for eligibility for the study. Criteria for entry to the study were current weekly use of amphetamine, and injection as a primary method of administration. 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 approximately one-and-a-half hours. All interviews took place at the research facility (the National Drug and Alcohol Research Centre) and were conducted by the first author. Questions were read out to subjects, who also had copies of the questionnaires in front of them to facilitate their comprehension, and their responses were recorded by the interviewer. Appendix A contains a copy of the interview schedule.

2.2 Structured Interview

2.2.1 Demographics and drug use history

Subjects were assessed with a detailed demographics and drug use history questionnaire which was based on the work of Hando and Hall[27]. This section covered the following areas:

- *demographic details,* including subject's gender, age, suburb of residence, educational history, employment history, income, living arrangements and children;
- *patterns of amphetamine use*, including frequency, quantity and duration of use, methods of administration, the availability of amphetamine, other drugs used concurrently with or to manage the after effects of amphetamine, and context and reasons for use; and
- *other drug use*, including past and recent use of cocaine, ecstasy, hallucinogens, inhalants, benzodiazepines, barbiturates, heroin, methadone, other opiates, marijuana, alcohol and tobacco, and other drugs.

The drug use history section also contained open-ended items asking subjects to describe what it is like to be "speeding" and "coming down", and the "best" and "worst" things about their amphetamine use.

2.2.2 The Composite International Diagnostic Interview

Subjects were all administered Section L, *Disorders resulting from the use of psychoactive substances* of the Composite International Diagnostic Interview (CIDI-

core)[28], which was scored using the CIDI data entry and scoring programs[29]. This psychiatric classificatory tool is considered to operationalize the World Health Organization concept of the dependence syndrome, and allowed all subjects to be assessed for a DSM-III-R diagnosis of amphetamine dependence. The relevant DSM-III-R diagnoses are *305.70 Amphetamine or similarly acting sympathomimetic abuse,* and *304.40 Amphetamine or similarly acting sympathomimetic dependence*[3]. This latter diagnosis is further subdivided in DSM-III-R on the basis of severity of dependence, as assessed by number of specific symptoms endorsed by subjects. Criteria for severity of substance dependence are:

- *mild*: few, if any, symptoms in excess of those required to make the diagnosis (three; refer to introduction for list of relevant symptoms), and the symptoms result in only mild impairment in occupational functioning or in usual social activities or relationships with others.

- *moderate*: symptoms or functional impairment intermediate between "mild" and "severe".

- *severe*: many symptoms in excess of those required to make the diagnosis, and the symptoms markedly interfere with occupational functioning or with usual social activities or relationships with others.[3]

At one point in the CIDI, respondents were shown a list of 36 withdrawal symptoms, and asked to specify which of the list they had ever experienced during amphetamine withdrawal.

2.2.3 The Severity of Dependence Scale

Subjects were administered the 5-item Severity of Dependence Scale (SDS[20]), which assesses psychological aspects of dependence. Items relate to an individual's feelings of impaired control over his/her own drug-taking, and to his/her preoccupation and anxieties about drug-taking.

2.2.4 The Severity of Amphetamine Dependence Questionnaire

The Severity of Amphetamine Dependence Questionnaire[18] was completed by all subjects. The psychometric properties of the questionnaire have only been examined once, and as yet, a cut-off point indicative of dependence has not been devised. Part of the rationale for including the questionnaire in the interview schedule was to further examine its psychometric properties.

2.2.5 The Motivation to Use Amphetamine Questionnaire

As pointed out in the discussion, the SAmDQ assesses the negative reinforcement capacity of amphetamine, and it was therefore considered necessary to supplement the questionnaire with items designed to assess the appetitive motivation to use amphetamine. Accordingly, a questionnaire was designed specifically for the study, and has been called the Motivation to Use Amphetamine Questionnaire (MTUAQ). The

research of Hando and Hall[27] was used as a starting point for the development of these additional items. They asked 231 amphetamine users about their "main reasons for continuing to use speed". The top eight responses were used to derive sixteen items with four-point response scales, on which subjects rated how relevant each item was to their own amphetamine use. The items assessed how often subjects use amphetamine for the following reasons: to feel good, for more energy, to party and have fun, to help with work/university, to relieve boredom, because it is cheap, to cope with worries and to drink more without getting drunk. Other items asked subjects how they feel before they use amphetamine (normal or dysphoric); how often they have strong urges to use amphetamine for the hedonic effect; how important different factors (energy, hedonics, wanting to "escape") are in their decision to use amphetamine; and for what reasons they would be likely to think about amphetamine when not using it. This questionnaire was conceptualised as assessing both the positive **and** negative reinforcement capacity of amphetamine, with five items pertaining to the use of amphetamine to remove some aversive physical or emotional state.

2.2.6 The Eysenck Personality Questionnaire (Revised)

Subjects all completed the 106-item Eysenck Personality Questionnaire (Revised; EPQ-R[30]). This instrument measures the major dimensions of personality, and gives the subscales *Extroversion (E), Neuroticism (N), Psychoticism (P), Addiction (A), Criminality (C)*, and *Lie (L)*. The latter subscale measures the propensity of subjects to answer questions in a socially desirable manner. The questionnaire was administered because it was hoped that a subgroup of this sample would participate in a planned cue reactivity study, for which data on personality may have provided interesting results.

2.2.7 The Rush Questionnaire

A seventh questionnaire was added to the interview schedule after 60 subjects had been interviewed. The questionnaire was added because it was observed that, in the open-ended questions of the drug use history section, a large proportion of subjects were identifying the "best" thing about using amphetamine as the "rush". It was therefore considered important to gain some insight into what this rush consists of. Seecof and Tennant[31] administered a list of 20 feelings (such as excitement, anger, control, pleasure, power, hunger, warmth, guilt, depression) to heroin-dependent subjects, and asked them to rank each feeling as *strongly*, *weakly* or *not at all* associated with the rush they experienced when administering heroin intravenously. The same questionnaire (with two changes; on the basis of pilot subjects, *unreality* in the original was changed to *not reality* in the present study, and *all is right* was changed to *everything is O.K.*) was administered to 70 subjects in order to provide some understanding of this form of appetitive motivation.

2.3 Data Analysis

Responses to individual items were tabulated by gender but there were very few differences between males and females; thus, combined results are reported but significant differences highlighted. Responses were also tabulated by DSM-III-R level

of dependence as derived by the CIDI (*mild/moderate* versus *severe*). Where distributions were skewed, medians are reported. For normally distributed continuous variables, *t*-tests were employed. Bonferroni adjustments were not used because most results were highly significant, but where Levene's test for equality of variances was significant, the more conservative *t*-value is reported because a large number of *t*-tests were employed. As a result, some degrees of freedom reported are taken to one decimal place. Categorical variables were analysed using Pearson's chi-square and Mann-Whitney *U*-tests[32]. Linear trends were assessed using the Mantel-Haenszel chi-square.[33]

Factor analyses (principal components and principal axis factoring[34]) were used to derive meaningful summary scores of each questionnaire. The factors derived in this fashion, along with demographic and drug use variables of theoretical interest, were then used in a multiple linear regression in order to determine which variables were most predictive of the number of CIDI symptoms reported. This outcome variable was continuous, with an approximately normal distribution. Even with the summary scores derived by factor analysis, there was still a large number of theoretically relevant variables that could have been used as predictors in regression analyses. Given that the sample size was not large enough to permit more than approximately twelve independent variables to be included in the variate[34], and that some degrees of freedom were captured by the use of categorical predictors requiring dummy encoding, it was decided that a reasonable model building strategy was to divide these possible predictors into conceptual subsets (demographics, involvement in drug subculture and correlates of heavy amphetamine use), and to build regression models within these subsets. The best predictors from each of these models were then entered into an overall model in order to determine the variables most predictive of dependence. All analyses were conducted using SPSS for Windows™, Release 6.0[35].

3.0 RESULTS

3.1 Sample Characteristics

3.1.1 Age and gender

Just under two-thirds (64.4%) of the 132 respondents were male. The age of the sample ranged from 17 to 51 years, median age 24 years (mean 26 years; SD 7.1 years). Male respondents were significantly older than females (27.4 versus 23.6 years; $t_{126.7}=3.4$, $p<0.001$).

3.1.2 Living arrangements and children

Respondents were recruited from all over Sydney; 40.9% of the sample resided in the inner city or eastern suburbs, 38.6% in the inner west, 20.1% in other metropolitan regions, and three participants (2.3%) were holidaying from interstate. This was a highly mobile sample, with only 25.8% of the sample having lived in one place in the previous 12 months. One-fifth (22%) had lived in two different places in the previous 12 months; 17.4% in three places; 25% in four to six different places; and 9.8% in seven or more places. Just over half the sample (54.5%) currently lived with friends; 15.2% of the sample alone; 13.6% with their partner; and 12.9% with their families. Two respondents (1.5%) were homeless; two lived in hostels; and one participant (0.8%) lived with her children. Less than one in six subjects (12.9%) had children; and in only five of these cases (3.8% of the sample) were the children dependent.

3.1.3 Education, employment and income

Median number of years completed at school was 12.5, with a range of eight to 15 years (mean 12.06; SD 1.19). Almost half (43.2%) of the sample had also completed courses after school; with 26.5% possessing trade or technical qualifications; and 16.7% completing a university degree or college course.

The majority of the sample (62.9%) were presently unemployed. Only 6.8% of the sample were currently employed on a full-time basis; 12.9% on a part-time/casual basis; 2.3% were self-employed and 15.2% of the sample were students. Over one-third (36.4%) had spent all of the preceding twelve months unemployed; 15.2% had spent most of this time unemployed; 15.9% half of it; 11.4% some of it; and 21.2% of the sample had been employed for the whole of the preceding 12 months.

Of those who had been employed for at least part of the preceding year, it was not uncommon for them to have had a number of different jobs in the 12 month period. 31.8% of the sample had held one job in the previous year; 19.7% had had two jobs; 9.1% had had three; and 10.6% had held four or more jobs in the preceding 12 months. Almost one-half (45.5%) of the sample had spent more of the preceding five years unemployed than in employment. One in seven (13.6%) of the sample nominated 'student' as their main occupation over the preceding five years; 10.6% sales or personal service; and 7.6% listed their main occupation as 'tradesperson'. Managers

(4.5%), professionals (3.0%), para-professionals (4.5%) and clerical workers (5.3%) were also represented in the sample.

The high rate of unemployment in the sample was reflected in the high proportion of low income earners. Of the sample, 3.8% estimated their income for the preceding 12 months to be between A$0 and A$5000; 40.9% between A$5000 and A$10000; 34.8% between A$10000 and A$20000; and 12.9% between A$20000 and A$30000. Only 7.6% of the sample estimated their income for the previous year to be above A$30000. Median salary range was between A$10000 and A$20000.

3.2 Patterns of amphetamine use

3.2.1 Current use frequency

The median age at which respondents had first used amphetamine was 17 years (mean 17.4; SD 3.6), giving an average duration of use of eight years. The median age at which subjects first began to use amphetamine regularly (at least once a month) was 18 years (mean 19.6; SD 4.7), and the median age at which participants first injected amphetamine (n=126) was 19 years (mean 19.4; SD 4.2).

Current patterns of amphetamine use were assessed both by the Opiate Treatment Index (OTI[36]) and by asking subjects to estimate their frequency of use over the preceding twelve months. According to the OTI, 3.8% of the sample were amphetamine less than weekly; 54.5% were using between weekly and daily; and 41.7% were using daily. These patterns were broadly consistent with subjects' own estimates of their frequency of use; 18.2% of the sample estimated that they had used amphetamine almost every day over the preceding twelve months; 59.8% estimated that they had used, on average, two or three days per week; and 21.9% once a week or less.

Table 1 shows the number of days respondents estimated that they had used amphetamine in the preceding month and the preceding six months. All respondents except one had used amphetamine prior to the preceding six months, and 39.4% of the sample had used amphetamine daily for three months at some stage.

Table 1: Number of days amphetamine used by respondents in the sample, for both the month and the six months preceding the interview.

PRECEDING MONTH		*PRECEDING SIX MONTHS*	
NO. DAYS USED	*% SAMPLE*	*NO. DAYS USED*	*%SAMPLE*
0	0.8	8-12	3.1
1-4	12.9	16-30	12.1
5-8	25.8	31-50	22.7
9-12	33.3	51-70	11.4
13-16	7.6	80+	50.8
17-30	19.7		

3.2.2 Amphetamine use episodes

The median duration of a *typical* episode of amphetamine use was relatively brief, at 2.5 days (mean 4.3; SD 6.1). Of the sample, 80.3% used amphetamine for between one and four days without stopping in a typical use episode, and 19.7% typically used for between five and 30 days without a break. Median length of longest "binge" in the preceding twelve months was 6 days (mean 18.6; SD 38.2; range one day to nine months). The greatest number of injections/snorts/pills taken in one day during the previous year ranged from two to 30; median number of administrations was 6 (mean 6.9; SD 4.2).

Subjects were also asked how many hits they would have in a *typical* day. 84.1% of the sample would have between one and four hits in a typical day; a further 6.8% would have five or six hits. Of all the regular injectors, only one indicated that the *fewest* hits they would have in a typical day would be greater than four; and 84.1% indicated that the fewest number of hits they would have in a typical day would be one or two. There was much greater variability in the *greatest* number of hits subjects would have in a typical day, although 76.5% of the sample said this would be between two and six. For the remainder of the sample, this figure was between seven and eighteen.

3.2.3 Methods of administration

Whilst injectors were specifically sought for this study, on the logic that injectors were likely to use more, and therefore be more dependent, than those who favoured other routes of administration[37], the huge majority of subjects had experimented with more than one method. Almost all (95.5%) of the sample had injected amphetamine; 91.7% had snorted; and 84.1% had swallowed. Over one-third (34.8%) had smoked amphetamine mixed with a cannabis cone ("snowcones"); 6.1% had anally administered amphetamine ("shelving"); and 4.5% had smoked amphetamine alone in the form of "ice" (methamphetamine). Snorting was the most common method of initial

use, reported by 67.4% of the sample, followed by injection (17.4%), swallowing (13.6%) and snowcones (1.5%). Injection was the method most likely to have been used most overall throughout respondents' amphetamine use histories (84.8%), followed by snorting (11.4%) and swallowing (3.8%). The great majority (93.9%) of the sample reported injection to be their most frequently used method of administration in recent times; 5.3% nominated snorting, and 0.8% nominated swallowing.

3.3 Context and reasons for amphetamine use

3.3.1 Places where respondents administer amphetamine

Whilst the results of this study were consistent with others which have shown that amphetamine is quite often used in a social setting such as a pub, nightclub or a gig[27], the most common places respondents would actually administer the drug were their own place (89.4%) or a friend's place (62.9%). Public toilets (31.8%), dealer's place (25.0%); cars (15.2%); parks (6.8%); nightclubs (6.1%) and motels in King's Cross that can be hired specifically for this purpose (4.5%) were also among the places participants would administer amphetamine.

3.3.2 Places respondents go after administering amphetamine

The most common activities subjects would engage in *after* they had administered amphetamine were stay home (76.5%); go to the pub (50.0%); go to music gigs (40.2%); do whatever they would be doing for the day anyway (for example, going to the DSS; grocery shopping; house cleaning and so on; 40.2%); go to nightclubs (28.0%); visit friends (23.5%); attend raves (8.3%); go to parties (6.8%); take long walks (6.8%); go to work (6.1%); go to dance parties (6.1%); and have sex (4.5%).

3.3.3 Reasons for first trying amphetamine

Reported reasons for first trying and for continuing to use amphetamine were also consistent with the notion that whereas amphetamine is originally used within a social context, once the pattern of use becomes heavier, the social milieu surrounding the drug become less important. This is in line with the notion of *narrowing of drug-using repertoire*, one of the elements of the dependence syndrome proposed by Edwards *et al.*[2], describing the tendency of the drug-taking habit to become increasingly stereotyped. The main reasons reported for first trying amphetamine were curiosity (endorsed by 94.7% of the sample); the fact that amphetamine is easy to get or was available at the time (65.9%); to party and have fun (63.6%); because others around were using (60.6%); to feel like one of the group (58.3%); for an energy burst (54.5%); because friends had told them it would make them "feel good" (37.9%); boredom (18.2%); because they were drinking/using other drugs at the time (15.2%); and because amphetamine is inexpensive compared to other drugs (mainly cocaine; 11.4%).

3.3.4 Reasons for continuing to use amphetamine

The reasons reported for continuing to use amphetamine after this initiation were to feel good (100%); for more energy (99.2%); to party and have fun (93.9%); boredom (68.9%); to help with work, uni or school (57.6%); because it is easy to get or readily available (57.6%); out of habit or because they feel agitated, tired or angry when they don't (53.8%); to cope with worries (49.2%); because they were drinking or using other drugs at the time (45.5%); to feel like one of the group (45.5%); because amphetamine is relatively cheap (40.2%); and to avoid using some other drug, usually heroin (28.8%).

3.3.5 The Motivation to Use Amphetamine Questionnaire

The questionnaire designed especially for this study, the MTUAQ, enquired about the frequency with which subjects had administered amphetamine for specific reasons over the preceding 12 months. Thus, questions were of the form, *I use speed because ...*, and subjects were required to endorse one of four response options (*never, sometimes, often, always*). Responses to the MTUAQ suggest that appetitive motivation to use amphetamine is making a substantial contribution to use, even in heavy users. Of this sample, 98.5% used amphetamine to make them feel good at least sometimes, and 47.7% always or nearly always use for this reason. Similarly, 98.5% used amphetamine for extra energy at least sometimes, and 39.4% always used for this reason. Even with a dependent sample such as this, 93.2% used amphetamine to help them party and have fun at least sometimes, and 28.8% always used for this reason.

On the other hand, 77.3% of this sample used amphetamine at least sometimes to relieve boredom, which could be considered aversive motivation, but in contrast to the high proportion of the sample who always used amphetamine for the appetitive motivations discussed above, only 6.8% of the sample always used to relieve boredom. Similarly, a substantial number of respondents (47.7%) indicated that they used amphetamine to help them cope with their worries at least sometimes, but only 5.3% always did, and 52.3% never did. Over one-third (39.4%) of the sample specifically used amphetamine at least sometimes so that they can drink more or use more other drugs without becoming incapacitated by their effects.

Other items aimed to assess the emotional states in which individuals are likely to think about amphetamine (*when I think about speed, it's the buzz that I think about;* and *when I think about speed, it's because I feel bad and speed could help me feel better*). In hindsight, these two questions are somewhat simplistic, in that they were originally conceived as assessing primarily appetitive motivation in the first instance, in that a neutrally affective state was envisaged, and even in the absence of some aversive state, the individual still thinks about the positively reinforcing effects of amphetamine. The second question was designed to assess aversive motivation to use, in that it was specified that the individual feels "bad" and thinks about amphetamine because it may help him/her feel better. However, it became clear that the two reasons for thinking about amphetamine were not mutually exclusive. The overwhelming majority (93.9%) reported that when they think about the "buzz" (high) at least sometimes, and over half (54.6%) reported that they think about amphetamine when they feel bad at least

sometimes. The items, *before I use speed I feel OK* and *before I use speed I feel pretty lousy*, were perhaps a little better designed, in that they seemed to assess different aspects of the motivation to use amphetamine. Of the sample, 97.7% feel OK at least sometimes before they use amphetamine, which suggests that in these cases, the positively rather than the negatively reinforcing effects of the drug are sought after. On the other hand, 77.3% of the sample feel lousy at least sometimes before they use amphetamine, and know that amphetamine will help them feel better. Thus, it would seem that both appetitive and aversive motivation can play a role.

One item, *I get strong urges to use speed because I love the feeling of speeding,* aimed to assess what underlies the urge to use, or craving. Almost every subject (94.7%) experienced strong urges to use amphetamine, and at least sometimes, these urges are based on an appetitive or approach motivation. That is, craving is not always founded in feeling sick and wanting to feel better, as it perhaps more commonly is in the case of alcohol or opiate dependence, but simply, because respondents like the positive, euphoric, energetic effects of amphetamine.

The final three items assessed how influential various factors (good times, extra energy and wanting to "escape from feeling bad or strung out") are in an individual's decision to use amphetamine. Responses to these items again suggest that both appetitive and aversive motivation play a role in amphetamine use. A minority of the sample (4.5%) reported that extra energy was not important at all to them, and 6.1% said that the good time you can have after using amphetamine was not at all important. Just over a quarter (27.3%) of the sample reported that wanting to escape was not important at all in their decision to use amphetamine.

Further analyses of this questionnaire were undertaken. Contingency tables were constructed between two levels of DSM-III-R dependence (*mild/moderate* and *severe*) and MTUAQ items. Examination of the tables revealed that some cells were not adequately filled; in these cases, the two top response options (*often* and *always or nearly always)* were collapsed together. Interestingly, it was only the negative reinforcement items that distinguished between the two levels of DSM-III-R severity of dependence. That is, there were no significant differences in response options chosen by *mild/moderately* and *severely* dependent respondents to items which asked about the frequency of use for the hedonic, energetic effects of amphetamine, but all the aversive motivation items showed significant linear trends across levels of response. Thus, item 5, *I use amphetamine because I'm bored*, showed a significant linear trend (Mantel-Haenszel $\chi^2_1 = 10.65$; $p=0.001$), whereby, across the three levels of response option, the number of *severely* dependent participants responding increased, whilst the number of *mild/moderately* dependent subjects decreased. Thus, whereas 34 of 99 *severely* dependent respondents indicated that they *often* or *always* use amphetamine because they are bored, only 2 of 33 *mild/moderately* dependent participants responded in this fashion. Item 6, *I use speed because it helps me cope with my worries*, showed a similar pattern (Mantel-Haenszel $\chi^2_1 = 13.87$; $p<0.001$); as did item 10, *When I think about speed, it is because I feel bad, and speed could help me feel better* (Mantel-Haenszel $\chi^2_1 = 17.77$; $p<0.0001$); item 12, *Before I use speed, I feel pretty lousy, and I know speed will help me feel better* (Mantel-Haenszel $\chi^2_1 = 8.43$; $p<0.01$); and item 16, *How important in your decision to use speed is wanting to*

"escape" from feeling bad or strung out? (Mantel-Haenszel $\chi^2_1 = 19.37$; p=0.001).

An internal consistency analysis of the MTUAQ yielded a Cronbach's alpha of .54, which, while below the recommendations of Nunnally[38] of an adequate internal consistency (.6), is not surprising, given that there was a deliberate attempt to assess what were hypothesised to be two separate domains, or factors, namely, positive and negative reinforcement. A number of different factor analyses were undertaken to confirm that this attempt was successful, including principal components, principal axis factoring and unweighted least squares analyses, all tested with three, four and five factor solutions, with oblique and varimax rotations. Results of all the analyses were quite similar; due to the exploratory nature of the research and in the interest of parsimony, it was decided that principal axis factoring (which extracts unique and error variance before examining common variance[34]) should be the chosen method. Five factors were extracted with eigenvalues greater than 1. However, the scree plot suggested that three factors were sufficient to summarise the data, and the three factor solution gave clearly defined, meaningful factors; hence, this solution was chosen. There was very little difference in the loadings in both orthogonal and oblique rotations, but because the first and second factors showed a low negative correlation (r=-.20), results of the oblique rotation are shown (see Table 2).

Table 2: Results of the three factor principal axis factoring solution of the MTUAQ (oblique rotation), plus Cronbach's alpha for each resulting scale.

	% VARIANCE ACCOUNTS FOR
FACTOR 1: NEGATIVE REINFORCEMENT	19.6
ITEM	*LOADING*
How important is wanting to escape?	.90
When I think about speed, it's because I feel bad	.75
Before I use speed, I feel pretty lousy	.73
I use speed to help me cope with my worries	.65
Cronbach's alpha for this scale=.83	
	% VARIANCE ACCOUNTS FOR
FACTOR 2: POSITIVE REINFORCEMENT	14.2
ITEM	*LOADING*
When I think about speed, it's the buzz I think about	.80
I use speed for the buzz and because it makes me feel good	.69
I get strong urges to use speed because I love the buzz	.68
Cronbach's alpha for this scale=.75	
	% VARIANCE ACCOUNTS FOR
FACTOR 3: ENERGY/PARTY DRUG	13.6
ITEM	*LOADING*
I use speed for the extra energy	.72
How important is the extra energy	.56
I use speed to help me party/have fun	.53
Cronbach's alpha for this scale=.60	

Thus, the above three factors will form the basis for summary scores of the MTUAQ, which will be used in later analyses. This seems reasonable, given that the factors are clearly defined and that if each is considered a scale assessed by the items which load on them, Cronbach's alpha indicates acceptable internal consistency[38].

3.3.6 Best things about amphetamine

Open-ended questions assessed the "best" and "worst" things about using amphetamine for respondents, with a limit of three answers per section. Where subjects had difficulty nominating three best and/or worst things, they were not forced to give three replies. The most common "best" things about using amphetamine, nominated by more than a quarter of the sample, were: the rush (66.7% of the sample); energy (in terms of a motivation/enthusiasm effect; 57.6%); euphoria (51.5%); and that

it acts as a confidence builder/social lubricant (44.7%). Table 3 shows the percentage of the sample nominating various aspects of amphetamine use as being the "best" things about the drug.

Table 3: "Best" things about using amphetamine for the 132 respondents in the sample.

"BEST" THING ABOUT SPEED	*% SAMPLE NOMINATED*
rush	66.7
energy (motivation)	57.6
euphoria	51.5
confidence builder/social lubricant	44.7
energy (stay awake)	22.0
creativity/productivity/efficiency	13.6
focussed/clear/analytical thinking	12.1
heightened sensations/alert/aware	12.1
ritual of scoring/mixing/injecting	6.1
have great sex	5.3
helps cope with stress	4.5
can drink more without getting drunk	4.5
calming after the stress of scoring	3.8
relieves boredom	3.0
under control relative to other drugs	3.0
not eating/weight control	3.0
good quality relative to other drugs	1.5
rebelliousness	1.5
cheaper/more available than cocaine	1.5

3.3.6.1 The Rush

As pointed out in the Method section, a further questionnaire was administered to the last 70 respondents, asking them to indicate which of a list of affective responses they considered to be *strongly, weakly* and *not at all* associated with the rush they get after injecting amphetamine. Table 4 shows the percentage of the sample endorsing each

feeling.

Table 4: Feelings associated with the amphetamine rush for the 70 respondents who completed this questionnaire.

FEELING	% SAMPLE (n=70) ENDORSED AS		
	NOT ASSOCIATED	WEAKLY ASSOCIATED	STRONGLY ASSOCIATED
pleasure	0	1.4	98.6
satisfaction	1.4	7.1	91.4
excitement	2.9	7.1	90.0
everything's OK	12.9	25.7	61.4
warmth	8.6	31.4	60.0
control	22.9	31.4	45.7
power	25.7	28.6	45.7
strength	20.0	34.3	45.7
thirst	25.7	34.3	40.0
not reality	35.7	37.1	27.1
sexual orgasm	42.9	38.6	18.6
relaxation	55.7	25.7	18.6
anxiety	47.1	47.1	5.7
anger	74.3	21.4	4.3
fear	70.0	25.7	4.3
hunger	88.6	8.6	2.9
guilt	80.0	17.1	2.9
threatened	88.6	8.6	2.9
depression	87.1	10.0	2.9
tired	95.7	2.9	0.8

Factor analyses were also undertaken on the Rush Questionnaire, in order to summarise the 20 variables into a more manageable number, for use in later analyses. A number of different analyses were performed, including principal components and principal axis factoring, with 8, 5, 4, 3 and 2-factor solutions examined. Results did not

differ much across analyses, and in the interest of parsimony, the results of the principal axis factoring will be reported. The four factor solution accounted for 43.7% of the variance and is quite interpretable; and because correlations between factors were all low (≤.18), the results of the orthogonal rotation are reported in Table 5.

Table 5: Results of the four-factor principal axis factoring solution of the Rush Questionnaire (orthogonal rotation).

	% VARIANCE ACCOUNTS FOR
FACTOR 1: PSYCHOLOGICAL DISTRESS	15.9
ITEM	*LOADING*
anger	.72
hunger	.71
depression	.62
guilt	.44
fear	.42
	% VARIANCE ACCOUNTS FOR
FACTOR 2: POWER/CONTROL	12.4
ITEM	*LOADING*
power	.74
control	.64
strength	.58
well-being	.47
thirst	.31
	% VARIANCE ACCOUNTS FOR
FACTOR 3: ANXIETY	7.8
ITEM	*LOADING*
threatened	.61
fear	.52
warmth	-.46
depression	.38
	% VARIANCE ACCOUNTS FOR
FACTOR 4: PLEASURE/SATISFACTION	7.5
ITEM	*LOADING*
pleasure	.59
well-being	.35
satisfaction	.32

The fact that these factors are relatively clearly defined, with "hunger" and "thirst" the only anomalies, and account for almost half the variance in responses to the rush

questionnaire, suggests that it is reasonable to use them in later analyses as summaries of this questionnaire .

3.3.7 Worst things about amphetamine

The most common "worst" things about using amphetamine, nominated by more than a quarter of the sample, were: irritability during the come down (33.3%); depression during the come down (32.6%); the expense (28.8%); and lethargy, exhaustion or weakness during the come down (27.3%). Table 6 shows the percentage of the sample nominating various aspects of amphetamine use as being the "worst" things about the drug.

3.3.8 Open-ended descriptions of "speeding"

Two other open-ended questions asked respondents to offer descriptions which they considered describe what it is like to be *speeding*, and what it is like to be *coming down*. Participants were asked to list five descriptions under each heading, but if they had difficulty, as many as they could comfortably offer were recorded. Alternatively, more expressive respondents found it easy to list six or seven descriptions, so all of these were recorded and coded for. Certain clear themes began to emerge quite quickly; thus descriptions which were semantically similar were grouped together under one heading. The most common descriptions of *speeding,* elicited from more than a quarter of the sample, were: euphoric (included descriptions such as fun, buzzing, happy, euphoric, ecstatic, positive about everything, extreme well-being, and so on; 85.6%); energetic (in terms of motivation and enthusiasm; 81.1%); sociable, self-confident and talkative (72.0%); rush (56.8%); heightened sensations (included descriptions such as stimulated, alert, aware, aroused, extra perceptive and so on; 42.4%); and invincible (included descriptions such as cocky, infallible, god-like, could overcome anything, right on top of it, and so on; 26.5%). Table 7 shows the percentage of the sample offering various descriptions of what it is like to be *speeding*.

There appeared to be two aspects to both the energy and the self-confidence commonly reported by amphetamine users after administering the drug. Respondents who used the word *energy* to describe what it is like to be speeding were questioned further about their use of this word, and there seemed to arise a *functional* component to this energy - that is, the physical act of remaining awake for hours on end, such as while working or during an all night rave - and an *affective* component, wherein subjects felt more motivated to do things, even if it was merely doing the housework or going to the pub for a game of pool, after using amphetamine. Similarly, *self-confidence* appeared to have two distinguishable yet related aspects; firstly, the social lubricant characteristics of amphetamine, so for example, after using amphetamine respondents felt more able to talk to people they did not know; and secondly, a feeling of immortality or invincibility, so, for example, respondents might pick more fights after using amphetamine because they feel empowered and unbeatable.

Table 6: "Worst" things about using amphetamine for 132 respondents in the sample.

"WORST" THINGS ABOUT SPEED	*% SAMPLE NOMINATED*
irritability*	33.3
depression*	32.6
expense	28.8
lethargy*	27.3
paranoia #	16.7
scattered (vague/mental confusion)*	14.4
frustration - can't eat/sleep/get comfy*	14.4
habit-forming/addictive	12.1
poor quality/worry of cutting agents	11.4
psychotic, toxic symptoms (eg. hallucinations) #	10.6
unspecified health risks	9.1
aches/cramps/stiffness*	9.1
stomach cramps/nausea*	9.1
vascular damage/track marks	8.3
not having any/craving it	7.6
sleep disturbance*	6.8
frustration at seediness of come down*	6.8
mood swings*	6.1
not eating/weight loss	6.1
anxiety #	6.1
antisocial/withdrawn/introverted*	6.1
illegality	6.1
guilt*	5.3
tolerance	4.5
shakes/tremors #	3.8
dangers inherent in IDU subculture	3.0
headaches*	3.0
anger/aggression/violence #	3.0
cosmetic/aging effects (skin, hair, eyes)	3.0
impairs sexual interest/performance	2.3

Note: * symptoms experienced during the come down # experienced either while speeding *or* while coming down

Table 7: Percentage of the 132 respondents in the sample nominating different descriptions of what it is like to be *speeding.*

DESCRIPTION	*% SAMPLE NOMINATED*
euphoric	85.6
energetic	81.1
sociable/self-confident/talkative	72.0
rush	56.8
heightened sensations	42.4
invincible	26.5
clear/focussed/analytical thinking	23.5
psychomotor agitation	17.4
productive/creative/efficient	15.9
paranoid	13.6
uninhibited	8.3
sexually active	7.6
scattered (vague/mental confusion)	6.1
easily distracted/obsess over trivialities	4.5
impatient/irritable/abrupt	4.5
calm (after the stress of scoring)	3.8
thirsty	3.0
anticipation - ritual of mixing/injecting	2.3

3.3.9 Open-ended descriptions of "coming down"

The most common descriptors of *coming down*, elicited from more than a quarter of the sample, were: irritable (72.7%); lethargic and unmotivated (71.2%); depressed (65.9%); physically exhausted but mentally overactive or "wired" (47.7%); stiff, aching or cramps (34.8%); stomach cramps, nausea or no appetite (33.3%); withdrawn, antisocial or insular (30.3%); and scattered (vague, trouble concentrating, mental confusion; 27.3%). Table 8 shows the percentage of the sample nominating various words as descriptions of what it is like to be *coming down.*

3.3.10 Withdrawal Symptoms Checklist

As withdrawal forms the basis for aversive motivation, a clear understanding of the elements comprising the phenomenon is required. Respondents were handed a list of different withdrawal symptoms, and were asked to indicate which of these they had experienced after using amphetamine. These results are shown in Table 9.

Table 8: Percentage of the 132 respondents in the sample nominating different descriptions of what it is like to be *coming down.*

DESCRIPTION	*% SAMPLE NOMINATED*
irritable	72.7
lethargic	71.2
depressed	65.9
exhausted but "wired"	47.7
stiff/aching/cramps	34.8
stomach cramps/nausea/no appetite	33.3
withdrawn	30.3
scattered	27.3
anxious/stressed	14.4
frustrated - can't eat/sleep/get comfy	13.6
headaches	13.6
paranoid	12.9
sore jaw from grinding	8.3
bad/seedy/crusty/want a shower/hell*	8.3
insecure/lonely	6.8
guilty	6.1
apathy	5.3
preoccupied with getting more speed	5.3
irrational/aggressive/unreasonable	4.5
hot/cold flushes/sweats	4.5
feeling something's missing in life	3.8
mood swings	3.8
anhedonia	3.8
faintness/dizziness	3.8
increased appetite	3.0
sexually active	2.3
sore, swollen eyes	2.3
obsess over things said/done on speed	2.3
physically sensitive	1.5
bored	0.8

Table 9: Percentage of the 132 respondents in the sample that reported experiencing specific amphetamine withdrawal symptoms.

SYMPTOM	*% SAMPLE EXPERIENCED*
fatigue/exhaustion	91.7
irritability	85.6
restlessness	85.6
lack of energy	84.8
apathy *	84.1
trouble sleeping	83.8
depression	83.8
on edge	79.5
difficulty concentrating	77.3
anxiety	76.5
weakness	74.2
muscle aches/cramps	73.5
decreased appetite	69.7
sweating	68.2
feeling slow and sluggish	66.7
heart beating fast	63.6
tremors (hands tremble)	62.1
seeing/hearing things	62.1
headaches	58.3
stomach aches	58.3
agitation **	53.0
yawning	48.5
hypersomnolence ***	46.2
intense craving for speed	42.4
vivid dreams #	40.2
nausea/vomiting	35.6
diarrhoea	34.8
increased appetite	31.8
runny eyes or nose	31.1
fever	22.0
fits or seizures	9.1

* *apathy* was operationally defined as "unkeen to do anything".
** *agitation* was operationally defined as "feel like I can't sit still".
*** *hypersomnolence* was operationally defined as "needing too much sleep". In hindsight, a better operational definition may have been "sleeping too much", because while subjects definitely feel like they *need* too much sleep, this is not to say that they are actually getting it whilst coming down.
\# *vivid dreams* was taken from the DSM-IV criteria for Amphetamine Withdrawal, where it is actually listed as vivid, unpleasant dreams. However, a number of subjects spontaneously crossed out the word unpleasant, and said that, when they do sleep after using amphetamine, their dreams are more vivid, but not necessarily unpleasant.

It seemed reasonable to suppose that the severity of withdrawal might discriminate between respondents of lesser and greater dependence, and therefore, factor analyses were undertaken on the list of 32 withdrawal symptoms, in order to summarise the variance in a parsimonious manner, for use in later analyses. It seemed fair to presume that variance unique to items is relatively small in this case, because *all* items were related to the comedown, and respondents had only to nominate whether the symptoms had been experienced during the comedown. In these situations, principal components analysis is the appropriate technique to use (Hair *et al*, 1995); therefore, the results of the principal components analyses are reported. The five factor solution accounted for 43.1% of the variance and yielded quite interpretable factors which were moderately correlated with each other (in the .21 - .28 range); thus, this solution with oblique rotation is shown in Table 10.

Table 10: Results of the five factor principal components analysis of the Withdrawal Symptoms Checklist (oblique rotation).

	% VARIANCE ACCOUNTS FOR
FACTOR 1: PSYCHOLOGICAL DISTRESS	19.1
ITEM	*LOADING*
anxious	.79
depressed	.76
irritable	.67
on edge	.64
sweating	.53
restless	.40
	% VARIANCE ACCOUNTS FOR
FACTOR 2: CIRCADIAN RHYTHM DISTURBANCE	7.3
ITEM	*LOADING*
increased appetite	.70
decreased appetite	-.61
trouble sleeping	-.59
hypersomnolence	.56

Table 10: Results of the five factor principal components analysis of the Withdrawal Symptoms Checklist (oblique rotation; continued).

	% VARIANCE ACCOUNTS FOR
FACTOR 3: PHYSICAL SYMPTOMS	6.0
ITEM	*LOADING*
runny eyes/nose	.66
fits/seizures	.65
fever	.61
diarrhoea	.56
nausea/vomiting	.56
	% VARIANCE ACCOUNTS FOR
FACTOR 4: FATIGUE	5.7
ITEM	*LOADING*
fatigue/exhaustion	.64
anergy	.63
slow/sluggish	.56
weakness	.54
	% VARIANCE ACCOUNTS FOR
FACTOR 5: PSYCHOLOGICAL DISTURBANCE	5.0
ITEM	*LOADING*
mental confusion	.66
heart beating fast	.65
hallucinations	.56
vivid dreams	.54
difficulty concentrating	.51

Thus, this solution yielded meaningful, relatively clearly delineated factors, which will be used in place of the original 32 items in later analyses, in order to conserve power.

3.4 Availability of amphetamine

3.4.1 Price of amphetamine (A$)

Typical street values of amphetamine ranged from $25.00 for 0.25 of a gram, up to $1100.00 for an ounce (28 grams). For those who were primarily obtaining their amphetamine from local (Sydney) sources, it was generally agreed that one gram could be bought for $100.00; a quarter of an ounce would cost somewhere between $250.00 and $350.00, depending on quality and the dealer; and that an ounce could be purchased from between $1000.00 and $1400.00. It was widely known that these estimates could be halved if the amphetamine was purchased in Melbourne, and a few

subjects that were also dealers travelled regularly to Melbourne to buy their amphetamine more cheaply. Whereas the majority (97.7%) of the sample could provide a "typical" street value of amphetamine, many did not pay these prices, being considered valued customers to the dealer, or selling some amphetamine for the dealer in return for "good deals". Most subjects reported purchasing half-a-gram (31.8%) or a gram (32.6%) last time they had bought some amphetamine (range: a quarter of a gram to one ounce), and 3.8% insisted that they never paid for amphetamine, receiving it exclusively as a gift from partner or friends.

3.4.2 Ease of obtainment of amphetamine

Only one subject (0.8% of the sample) reported that amphetamine is "hard" to obtain; 72.7% of the sample considered it "very easy", and 26.5%, "easy". Heroin was also generally considered very easy to obtain by those who used it regularly (60.4% of the sample). Of these, 70.2% described heroin as "very easy" to obtain; 25.2% as "easy"; and 5.1% as "hard" or "very hard". Cocaine and hallucinogens appeared to be more difficult to obtain, but even these drugs are still relatively readily available. Of those that used cocaine regularly (57.6% of the sample), 71.2% considered it "very easy" or "easy" to obtain; whereas only 28.8% considered it "hard" or "very hard" to obtain. 55.3% of the sample used hallucinogens regularly, and of these, 47.9% described them as "very easy" to obtain, 43.8% as "easy", and 8.3% as "hard".

3.4.3 Procurement of amphetamine

Most of the sample bought their amphetamine from dealers (74.2%) or friends (61.4%); a smaller proportion (18.9%) were regularly "shouted" their amphetamine by partner or friends; and an even smaller group (11.4%) were not averse to going into a pub or hotel where they didn't know anyone and try to score, although this would generally be a last resort. Of the amphetamine that they purchased, 65.2% of the sample used it all themselves, and 34.8% used some and sold some. In the majority of cases, the latter respondents were not so much interested in making money as in saving it; that is, they generally sold enough that they made their money back, and would keep the rest for personal use.

3.4.5 Knowledge of chemical composition of amphetamine

Only 13.6% of the sample indicated that they were "never" aware of the chemical composition of the amphetamine they used (that is, its purity and what it may have been cut with); 19.7% were "rarely" aware; 18.2% "sometimes"; 30.3% "often"; and 18.2% "always" aware. Those that reported that they rarely, sometimes, often or always "knew" what they were using were asked how they knew. 74.2% of the sample reported that they used the same dealer/s and therefore could rely on "word of mouth", as the same dealer would have the same "batch" for some time, so that it was therefore likely that friends would have used it. Just under one-half (41.7%) of the sample relied on the appearance of the amphetamine, the main dimensions being how "crystally" (as opposed to powdery) it is and its colour. Over one-third (36.4%) of the sample trusted their dealer; 25.8% relied on the way it dissolves in the mixing procedure (impurities do not dissolve); 22.7% tasted their amphetamine before they injected it; 16.7% smelt it;

and 14.4% of the sample said that they knew what they were using from the drug's effects.

When asked what the amphetamine they obtain is usually cut with, 37.9% of the sample reported that they did not know, a figure inconsistent with the 13.6% who said they "never" knew what they were using. Of those that offered an answer, a number of cutting agents were generally identified. The most common were glucose/glucodin (46.2%); Epsom salts (10.6%); bicarbonate of soda (4.5%) and vitamin B or C (4.5%). Other responses included soap, procaine, novocaine, baby laxative, milk powder, ephedrine and pseudoephedrine. A smaller proportion (5.3%) of the sample believed that their amphetamine was not contaminated in any way, as they were buying in tablet or crystal form.

3.5 Other drug use

3.5.1 Summary of drug use history

Although the sample was recruited for interview because they were heavy amphetamine users, many were presently, or had previously been, heavy users of a number of other drugs also. Table 11 displays a summary of the drug history of the sample.

It can be seen from Table 11 that, apart from amphetamine, the illicit drugs respondents were most likely to have experimented with were cannabis, hallucinogens, cocaine and heroin. The drugs that respondents were most likely to have used daily for three months at some stage were tobacco, cannabis, alcohol, amphetamine, heroin and the benzodiazepines. Female respondents were significantly less likely to have drunk daily for three months than were their male counterparts (OR=0.40; 95% CI: 0.18 - 0.89).

3.5.2 Drugs used in conjunction with amphetamine

The entire sample reported having used a variety of other drugs in conjunction with amphetamine, and to manage the aversive effects of the "come down" afterwards. The most commonly used drug "while speeding" was more amphetamine; that is, 99.2% of the sample reported administering amphetamine more than once in a use episode. The major classes of other drugs used in conjunction with amphetamine, and per cent of the sample reporting their use "while speeding", were tobacco (84.1%); cannabis (83.3%); alcohol (specified more than five drinks per occasion: 64.4%); hallucinogens (46.2%); ecstasy (36.4%); cocaine (35.6%), amyl nitrate (32.6%); heroin (32.6%); benzodiazepines (25.8%); nitrous oxide bulbs (25.0%) and methadone (13.6%).

Table 11: Patterns of other drug use of the 132 respondents in the sample.

DRUG	% EVER USED	% USED IN LAST MONTH	% USED ≥ WEEKLY FOR LAST 6 MONTHS	% EVER USED DAILY FOR 3 MONTHS	% EVER INJECTED
alcohol	99.2	87.1	62.1	48.5	0.8
cannabis	97.0	86.4	71.2	76.5	-
hallucinogens	97.0	24.2	10.6	10.6	34.1
tobacco	89.4	84.1	81.1	87.9	-
cocaine	87.9	30.3	8.3	9.8	63.6
heroin	80.3	50.0	38.6	34.8	77.3
benzodiazepines	78.0	57.6	47.0	22.7	32.6
ecstasy	75.8	18.2	6.0	2.3	40.9
amyl nitrate	75.8	16.7	10.6	3.0	-
other opiates	51.5	9.3	3.0	4.5	32.6
other inhalants*	49.2	19.7	8.3	6.1	-
methadone	41.7	17.4	14.4	18.2	20.5
barbiturates	14.4	1.5	0	1.5	6.1

NOTE: * primarily nitrous oxide bulbs # includes LSD, mescaline and MDA

3.5.3 Drugs use to manage amphetamine withdrawal

The most common drugs that respondents reported using to manage withdrawal from amphetamine were tobacco (82.6%); cannabis (82.6%); amphetamine (that is, managing the come down by delaying it; 81.8%); benzodiazepines (71.2%); alcohol (56.1%); heroin (49.2%); methadone (18.9%); and nitrous oxide bulbs (10.6%). Female respondents were significantly less likely to report having used heroin to manage amphetamine withdrawal (OR=0.44; 95% CI: 0.2 - 0.97). Some subjects reported that if amphetamine was not available with which to delay withdrawal, they would administer ecstasy (8.3%); hallucinogens (4.5%); amyl nitrate (4.5%) or cocaine (4.5%).

3.5.4 Preferred drugs

Table 12 displays the percentage of the sample identifying particular drugs or

combinations of drugs as their "favourite" drug.

Table 12: Preferred drugs of the 132 respondents in the sample.

DRUG	*% SAMPLE "FAVOURITE" DRUG*
amphetamine	38.6
heroin	22.0
cannabis	18.9
cocaine	12.9
ecstasy	11.4
LSD, mescaline, MDA	5.3
speedballs (cocaine+heroin)	4.5
tobacco	2.3
alcohol	2.3
opium	1.5
amphetamine+heroin	1.5

NOTE: percentages do not sum to 100 because many respondents found it difficult to nominate a single drug as their favourite.

3.6 Dependence

3.6.1 The CIDI

Respondents were administered the *Disorders resulting from the use of psychoactive substances* module of the CIDI, which allowed assignment of a DSM-III-R and an ICD-10 diagnosis of amphetamine abuse or dependence. Of the 132 subjects, none were assigned a primary diagnosis of amphetamine abuse; 99, or 75% of the sample, met the DSM-III-R criteria for severe amphetamine dependence; 30 participants (22.7%) met criteria for moderate amphetamine dependence; and 3 respondents (2.3%) were assigned a diagnosis of mild amphetamine dependence. Table 13 shows the percentage of the 132 respondents in the sample who indicated that they had experienced the specific symptoms assessed in the CIDI, and the element of the dependence syndrome each symptom measures.

Table 13: Percentage of the 132 respondents in the sample endorsing each specific symptom assessed by the CIDI.

CIDI SYMPTOM	*ELEMENT OF DEPENDENCE SYNDROME ASSESSING*	*% SAMPLE*
withdrawal symptoms	withdrawal (neuroadaptation)	100.0
tolerance	tolerance (neuroadaptation)	99.2
often used larger amounts/ longer than intended	compulsion	94.7
great deal of time spent using/ getting/recovering from speed	salience/compulsion	93.2
emotional or psychological problems caused or exacerbated by speed	salience	93.2
such a strong desire that could not resist it	compulsion	90.2
withdrawal relief drug-taking	use of drug to relieve or avoid withdrawal	88.6
intoxicated or coming down while at work, school or taking care of children	salience	80.3
speed-related problems with family, friends, at work, at school or with the police	salience	73.5
given up or greatly reduced important activities in order to get or to use speed	salience	72.7
wanted to stop/cut down but couldn't	readdiction liability	64.4
intoxicated or coming down when that increases chances of getting hurt	salience	56.8
health problems caused or exacerbated by speed	salience	54.5

These symptoms were then examined in terms of proportions of *mild/moderately* and *severely* dependent respondents who endorsed experiencing them. Table 14 shows these results and the χ^2 tests used to determine whether these differences were

significant.

Table 14: Percentage of *mild/moderately* (n=33) and *severely* (n=99) dependent respondents who endorsed having experienced each CIDI symptom, and the χ^2 and p-value for each of the symptoms.

CIDI SYMPTOM	*% SEVERE ENDORSED*	*% MILD/MOD ENDORSED*	χ^2	p
use when increases chance of getting hurt	62.6	39.4	5.4	.02
such strong desire to use could not resist	96.0	72.7	15.1	<.001
wanted to stop/cut down but couldn't	81.8	12.1	52.4	<.001
great deal of time using/scoring/recovering	100.0	72.7	29.0	<.001
often used larger amounts or for longer than intended	100.0	78.8	22.2	<.001
tolerance	100.0	97.0	3.0	NS
withdrawal	100.0	100.0	-	-
withdrawal relief drug-taking	94.9	69.7	15.7	<.001
health problems caused by amphetamine	55.6	51.5	.16	NS
emotional/psychological problems	99.0	75.8	21.0	<.001
given up/greatly reduced important activities	88.9	24.2	52.1	<.001
speeding or coming down while expected to fulfil role obligations	84.8	66.7	5.2	.02
problems with family, friends, police, work or school	81.8	48.5	14.1	<.001

It can be seen from the table that there were significant differences in the proportions of *mild/moderately* and *severely* dependent respondents who endorsed experiencing every CIDI symptom except for tolerance, withdrawal and health problems, for which there were no differences in the proportions of each group that reported their experience.

3.6.2 The SDS

Dependence was also assessed using the Severity of Dependence Scale (SDS). Median SDS score was 5.5 (mean 6.2, SD 3.5), with the full range of possible scores (0-15) represented in the sample. Hando and Hall[27] suggest that a score of 4 on the SDS is indicative of amphetamine dependence; using this cut-off point, 74.2% of the sample would be classified as amphetamine dependent. A *t*-test indicated that mean SDS score of DSM-III-R *severely* dependent respondents was significantly higher that of *mild/moderately* dependent respondents (7.1 versus 3.6; $t_{83.4}$=-6.24; p<.001). Spearman's correlation coefficient indicated a significant relationship between the SDS and DSM-III-R diagnosis (r=.42; p<.001). The correlation between SDS score and the number of days used in the last six months was also significant (Pearson's r=.35, p<.001).

Contingency tables were constructed between the two levels of DSM-III-R dependence and all five items of the SDS. For four of the five items, the two top response options (*often* and *always or nearly always*) were collapsed in order to adequately fill each cell; this transformation was not required for item 2. The two levels of dependence showed a significant linear trend across the possible response options of all five SDS items, indicating that as frequency of experiencing each symptom increased (from *never* through to *always*), higher proportions of *severely* dependent respondents were endorsing each option. On the other hand, as frequency of experiencing each symptom increased, lower proportions of *mild/moderately* dependent subjects were endorsing the options. The relevant statistics for each item were: *did you think your speed use was out of control*, Mantel-Haenszel χ^2_1 =15.7; p<.001; *missing a hit make you worried*, Mantel-Haenszel χ^2_1 = 10.0; p=.002; *did you worry about your speed use*, Mantel-Haenszel χ^2_1 = 19.5; p<.001; *did you wish you could stop*, Mantel-Haenszel χ^2_1= 13.6; p<.001; and *how difficult would it be to stop*, Mantel-Haenszel χ^2_1 = 17.0; p<.001.

Factor analyses of the SDS were undertaken in order to confirm that it was reasonable to sum the items of a scale and use total SDS score as a summary measure. Loadings were slightly lower in the principal axis factoring analysis that in principal components, indicating that some unique and error variance had been extracted before the common variance was examined[34]; thus, it was decided that the principal axis factoring (common factor analysis) was the most parsimonious solution. The factor accounted for 61.9% of the variance in responses to the SDS, and the loadings of the items on this factor were all satisfactory, at .70 or above. Further justification of using the total SDS score as a summary measure of all 5 items, to be employed in later analyses, was provided by a reliability analysis of the scale; the items showed good internal consistency, with a Cronbach's alpha coefficient of .84.

3.7 The Severity of Amphetamine Dependence Questionnaire

3.7.1 Psychometric properties of the SAmDQ

As pointed out in the Method section, the SAmDQ is a relatively new measure of dependence, and its psychometric properties were of interest in the present analyses.

3.7.1.1 Initial analyses

For comparison, the present analyses follow those of Churchill *et al.*[18] Image factor analyses were undertaken on the items in each of the four sections of the SAmDQ (that is, *physical withdrawal, affective withdrawal, withdrawal relief drug-taking* and *reinstatement after abstinence*) to determine the internal structure of each section. Table 15 shows the item factor loadings and the internal consistency coefficient of each section. For each section of the questionnaire, a single factor was extracted with an eigenvalue greater than one. These single factors accounted for 33.2% of the variance in the *physical withdrawal* section; 33.3% of the variance in the *affective withdrawal* section; 50.6% of the variance in the *withdrawal relief* section; and 87.2% of the variance in the *reinstatement* section.

According to the conventions proposed by Nunnally[38], the magnitude of Cronbach's alpha indicates acceptable internal consistency for each section, and the coefficients approximate those found by Churchill *et al.* The exception is the *reinstatement after abstinence* section, which shows better internal consistency in the present analyses (0.98) than in the analyses of Churchill *et al.* (0.74). Composite scores were calculated for the first three sections of the SAmDQ (ie. exclusive of *reinstatement*) and Cronbach's alpha coefficient was 0.90, equivalent to that obtained by Churchill *et al.* Moreover, similar percentages of variance of each section were accounted for by the first factors in the present analyses, as were accounted for by Churchill *et al.* However, once again, the *reinstatement* section performed better, with 87.2% of the variance in this section accounted for by the first factor, compared with 30.6% in the Churchill *et al.* analyses. For reasons pursued in the Discussion, it was considered that this strong psychometric performance of the *reinstatement* section may have been an artefact, and therefore, the summary scores derived from factor analyses of this questionnaire excluded the "reinstatement" factor.

Table 15: Results of an image factor analysis and reliability coefficient alpha on each of the four main sections of the SAmDQ

SECTION 1: PHYSICAL WITHDRAWAL	% VARIANCE ACCOUNTS FOR 33.2
ITEM	*LOADING*
Body aches	0.48
Stomach cramps	0.61
Feel sick	0.62
Heart pounding	0.48
Hot and cold flushes	0.67
Cronbach's alpha=0.78	

SECTION 2: AFFECTIVE WITHDRAWAL	% VARIANCE ACCOUNTS FOR 33.3
ITEM	*LOADING*
Miserable or depressed	0.61
Tense	0.61
Irritable or angry	0.55
Lethargic and really tired	0.56
Restless and unable to relax	0.60
Strong craving	0.52
Cronbach's alpha=0.80	

SECTION 3: WITHDRAWAL RELIEF	% VARIANCE ACCOUNTS FOR 50.6
ITEM	*LOADING*
Save drug to use on waking	0.72
Drug taken within 2 hours of waking	0.82
Use in the morning to stop sickness	0.54
First thing think of on waking is to take drug	0.69
Drug taken on waking to stop aches or stiffness	0.61
Drug taken on waking to depression	0.74
Drug taken on waking to get self going	0.79
Drug taken immediately on waking	0.74
Cronbach's alpha=0.90	

SECTION 4: REINSTATEMENT AFTER ABSTINENCE	% VARIANCE ACCOUNTS FOR 87.2
ITEM	*LOADING*
How long before using every day again	0.88
How long before sick on waking again	0.96
How long before depressed again	0.95
How long before lethargic and really tired again	0.93
How long before using first thing in morning again	0.94
Cronbach's alpha=0.98	

3.7.1.2 Structure of the SAmDQ

The principal axis factoring analysis was undertaken on items pooled from all four sections of the SAmDQ; whilst this was not consistent with the analyses of Churchill *et al.*, the *reinstatement* section was relevant to a far greater proportion of the present sample than the sample of Churchill *et al.* (84.1% versus 45.5%). That is, to respond to this section, subjects had to have stopped using amphetamine completely for at least two weeks, and many more subjects from the present sample met this criterion. Five factors were extracted with eigenvalues greater than 1, together accounting for 70.5% of the variance. However, examination of the scree plot suggested that three factors was sufficient to parsimoniously account for the results, and the analysis was undertaken again, with a specification that three factors should be extracted. Results of this analysis are presented in Table 16.

The solution accounted for 60.8% of the variance in responses to the SAmDQ with only three factors, which are theoretically meaningful. The three factors could be clearly interpreted as "withdrawal" (both physical and affective); "reinstatement"; and "withdrawal relief". Some overlap between factors existed in that the items *craving* and *using in the morning to stop feeling sick* loaded on both the "withdrawal" and the "withdrawal relief" factors . However, the results of the oblique rotation were reported because the correlation between factors 1 and 3 was significant (r=.43), so it is not surprising that some variables loaded on both factors.

Consistent with Churchill *et al.*, a SAmDQ total score was calculated by adding together the composite scores from the *physical* and *affective withdrawal*, and the *withdrawal relief* sections. The *reinstatement after abstinence* composite score was not included in this total, because this score was not calculated for every subject. The correlation between DSM-III-R level of dependence and total SAmDQ scores was also significant (r=0.46). Differences in SAmDQ scores between respondents classified as *mild/moderately* (n=33) and *severely* dependent (n=99) by the CIDI were examined by t-tests. Summary scores were all significantly higher for *severely* dependent respondents; mean total *physical withdrawal* (9.2 v 6.9; $t_{84.4}$=-4.88, p<.001), *affective withdrawal* (13.4 v 9.9, $t_{72.1}$=-5.79, p<.001) and *withdrawal relief* (14.4 v 10.4; $t_{99.3}$=-5.36, p<.001) all indicated that these subjects experienced the symptoms assessed in these sections more frequently than their *mild/moderately* dependent counterparts. There were also significant differences between *severely* and *mild/moderately* dependent respondents in total SAmDQ scores (36.9 v 27.3, $t_{99.2}$=-7.22, p<.001) and total SDS scores (12.0 v 8.6, $t_{83.4}$=-6.24, p<.001).

Table 16: Pattern matrix from a principal axis factoring analysis of items from the *physical withdrawal, affective withdrawal, withdrawal relief drug-taking* and *reinstatement after abstinence* sections of the SAmDQ.

	Factor loadings after oblique rotations		
Variable	Factor 1 (30.8%)	Factor 2 (19.1%)	Factor 3 (10.9%)
PHYSICAL WITHDRAWAL			
Body aches	.15	.08	*.48*
Stomach cramps	-.07	-.01	*.62*
Feeling sick	-.04	-.04	*.67*
Heart pounding	-.14	-.12	*.67*
Hot and cold flushes	-.07	.02	*.79*
AFFECTIVE WITHDRAWAL			
Depressed	.23	.05	*.50*
Tense	.07	.05	*.60*
Irritable	.08	.10	*.52*
Lethargic	.13	.07	*.40*
Restless	.07	.02	*.69*
Craving	*.41*	.09	.33*
WITHDRAWAL RELIEF			
Save drug to use on waking	*.77*	-.07	-.04
Drug taken within 2 hours of waking	*.91*	-.05	-.08
Drug taken to stop sickness	*.42*	-.04	.30*
Thinking of drugs on waking	*.70*	.13	.14
Drug taken to stop aches	*.53*	-.10	.22
Drug taken to stop depression	*.72*	-.03	.10
Drug taken to get self going	*.82*	-.02	-.00
Drug taken immediately on waking	*.85*	.04	-.18
REINSTATEMENT AFTER ABSTINENCE			
How long till using in morning	.06	*.88*	.04
How long till felt sick on waking	-.06	*.96*	.04
How long till felt depressed	-.08	*.97*	.03
How long till felt lethargic	-.12	*.95*	-.03
How long till using first thing	.06	*.97*	-.06

Note: highest loadings are italicised to facilitate interpretation.
* indicates variables with split loadings.

3.8 The Eysenck Personality Questionnaire (Revised)

Each subject was administered the Eysenck Personality Questionnaire, Revised edition (EPQ-R; Eysenck and Eysenck, 1991). In reporting the results of the EPQ-R (see Table 17), it was decided to compare the obtained results of the present study, with the norms reported in the Manual of the EPQ-R, for the age groups 21-30 years. This seems reasonable, given that 59.1% of the sample fell within this age range. Further, where possible, EPQ-R results of another group of drug dependent persons (cited in Eysenck and Eysenck[30]; n=141) are also included.

Table 17: Mean EPQ-R scores for the present sample, a comparative sample, and age norms.

		Psychoticism		*Extroversion*		*Neuroticism*	
		MEAN	**SD**	**MEAN**	**SD**	**MEAN**	**SD**
present sample	***male***	11.73	3.73	15.27	4.91	16.01	4.66
	female	12.53	4.18	14.70	5.30	15.96	5.34
Gossop and Eysenck (1980)#	***male***	10.66	4.64	15.23	4.94	15.79	4.67
	female	12.11	3.83	14.71	5.32	18.91	3.57
norms (21-30)	***male***	8.65	4.56	14.50	5.64	11.08	5.37
	female	6.20	3.86	14.17	4.68	12.53	4.78
		Lie		***Addiction***		***Criminality***	
		MEAN	**SD**	**MEAN**	**SD**	**MEAN**	**SD**
present sample	***male***	4.73	3.24	18.41	4.63	18.12	4.81
	female	6.02	3.75	17.87	4.96	18.34	5.21
Gossop and Eysenck (1980)#	***male***	3.11	2.75	19.83	4.96	15.57*	5.18*
	female	3.04	2.42	20.25	5.73	-	-
norms no age specified	***male***	5.53	3.39	11.60#	4.96#	9.01*	4.54*
	female	6.33	3.82	12.61#	4.18#	-	-

NOTE: * The mean criminality score of the present sample has been compared for illustrative purposes with the data of Eysenck and Eysenck (1971; cited in Eysenck and Eysenck[30]), who administered their criminality scale to 934 male prisoners and 189 male controls. They included their control data in the Manual as normative data; hence,

this is what appears in the above table for norms on criminality scores.
Gossop and Eysenck (cited in Eysenck and Eysenck)[30] administered all scales to a sample of drug dependent persons and to non-dependent controls. Appearing in the above table for addiction scale norms is the data obtained from their control group.

There were no significant differences between males and females on any of the sub-scales of the EPQ-R. Results for this sample of drug-dependent persons are quite similar to those of Gossop and Eysenck (cited in Eysenck and Eysenck)[30]. Compared to normative data, this sample had elevated *P* and *N* scores, relatively similar *E* and *L* scores, and were, not surprisingly, very high on *A* scores. This sample had somewhat higher scores on the *C* scale than the prisoners on whom the scale was devised (18.23 vs. 15.57).

3.9 Predicting severity of dependence

3.9.1 Rationale

Multiple linear regression analyses were employed to identify which of several possible independent variables could best predict severity of amphetamine dependence. Given that the CIDI is considered to operationalize the WHO concept of the dependence syndrome, on which DSM-III-R is based, it was decided that the number of CIDI symptoms reported would be used as the outcome variable. This outcome was a continuous variable with an approximately normal distribution.

As has been discussed, factor analyses were used to obtain summary scores of each of the different questionnaires used in the interview schedule. Once the factor solutions had been derived, the scores of the items loading on these factors were summed to obtain summary scores for each subject. That is, each variable comprising the factors were given equal weights in deriving summary scores to ensure generalizability of the results to the whole population, rather than using the weights of each variable, which may be optimum only for the particular data set[33]. Other variables of theoretical interest, such as demographic and drug use variables, were also examined.

The structured interview schedule employed in this study was quite detailed, and, even with the summary scores derived in the manner previously described, there was still a large number of theoretically relevant variables that could have been used as predictors in regression analyses. Given that sample sizes were not large enough to permit more than approximately twelve independent variables to be included in the variate (Hair *et al.*[34] recommend that the ratio of observations to independent variables should never fall below five, and that the desired level is 15 to 20 observations per independent variable), and that some degrees of freedom were captured by the use of categorical predictors requiring dummy encoding, it was decided that a reasonable strategy was to divide these possible predictors into conceptual subsets, and to build regression models within these subsets. The best predictors from each of these models were then entered into an overall model in order to determine the variables most predictive of dependence[39].

3.9.2 Developing conceptual subsets of predictors

The first conceptual subset of predictors developed was those measuring **demographics**. Demographic variables which may reasonably have been associated with lesser or greater dependence were age, gender, number of years of education, current employment status, proportion of the previous twelve months spent unemployed, and estimated income for the preceding twelve months. Assumptions of normality of continuous predictors were checked. The second subset of predictors developed was conceptualized as **involvement in the drug subculture**. Variables included in this subset were: number of drugs other than amphetamine ever tried, number of drugs ever injected, the number of people known to the subject to use amphetamine, average frequency of use of amphetamine in the preceding twelve months, the *Q* score relating to amphetamine from the OTI (a measure of involvement with the drug), the duration of amphetamine use, the average number of days in a row on which amphetamine is administered, and whether the respondent had ever used amphetamine daily for three months. Continuous variables were checked to ensure they met the assumption of normality, and two (*Q* score and duration of use) were highly skewed. Given that linear regression assumes an approximately normal distribution, both were transformed by taking the natural logarithm of each raw score. The normality of these transformed distributions was satisfactory. The final subset of predictors developed was conceptualized as **correlates of heavy amphetamine use**, and included the variables total SDS score, SAmDQ total withdrawal score (obtained by summing the physical and affective withdrawal scores, in line with the factor structure suggested by principal axis factoring analyses), SAmDQ withdrawal relief scores, the six EPQ-R subscales, summary scores of the five factors derived from factor analyses of the Withdrawal Symptoms Checklist and summary scores of the three factors derived from factor analyses of the MTUAQ. Assumptions of normality for the continuous predictors were all met.

3.9.3 Preliminary analyses

As a preliminary step in the analyses, appropriate univariate examined the relationships of these variables to the outcome, as well as too each other. The EPQ-R scales of *C, A* and *N* were all highly intercorrelated (r>.8); and an internal consistency coefficient of .94 for the three items suggested that the three subscales were measuring the same underlying dimension. This was confirmed with a principal components analysis, which revealed only one factor with an eigenvalue greater than 1, on which each of the three variables loaded strongly (.89 or higher). Therefore, to avoid collinearity in the regression analyses, the mean of these three variables was calculated for each subject, and the new variable, EPQ-total, which met the assumptions of normality, was entered into the regression. This had the added advantage of increasing the degrees of freedom in the regression. Table 18 shows the results of significant relationships between the potential predictors from the three conceptual subsets and the outcome variable, and Table 19 shows the results of the nonsignificant relationships.

Table 18: Significant results of tests of univariate relationships between the potential predictor variables, and the outcome variable, number of CIDI symptoms reported.

VARIABLE	*TEST STATISTIC*	*p*
used amphetamine daily for three months	$F_{1,130}=12.39$	.001
log of average number of days use in a row	$r=.27$	.002
mean number of other drugs ever tried	$r=.17$	.05
amphetamine use frequency	$F_{2,129}=4.11$	.019
natural logarithm of *Q* score from the OTI	$r=.20$	.02
EPQ-R total (mean of *A,C* and *N*)	$r=.39$	<.001
EPQ-R *P* score	$r=.29$	.001
total SDS score	$r=.64$	<.001
SAmDQ total withdrawal score	$r=.53$	<.001
SAmDQ total withdrawal relief score	$r=.42$	<.001
MTUAQ negative reinforcement factor	$r=.50$	<.001
withdrawal psychological distress factor	$r=.39$	<.001
withdrawal physical symptoms factor	$r=.32$	<.001
withdrawal psychological disturbance factor	$r=.35$	<.001

These variables will be examined further in multiple linear regression models, in order to determine which are most predictive of the number of CIDI symptoms reported.

Table 19: Nonsignificant results of tests of univariate relationships between the potential predictor variables, and the outcome variable, number of CIDI symptoms reported.

VARIABLE	*TEST STATISTIC*
mean age at time of interview	r=-.06
number of years of education	r=-.06
gender of respondent	t=-.65
current employment status	$F_{2,129}$=.20
proportion of preceding 12 months unemployed	$F_{4,127}$=.28
estimated income for preceding 12 months	$F_{3,128}$=1.75
number of people known to use amphetamine	$F_{3,128}$=.32
number of drugs ever injected	r=.11
natural logarithm of use duration	r=.12
EPQ-R *L* score	r=-.10
EPQ-R *E* score	r=-.15
MTUAQ positive reinforcement factor	r=.07
MTUAQ energy/party factor	r=-.03
withdrawal symptoms fatigue factor	r=.08
withdrawal circadian rhythm disturbance factor	r=.10

It is clear from this table that no demographic variables are significantly related to the number of CIDI symptoms reported in univariate analyses; therefore, these variables will not be examined further in the regression analyses.

3.9.4 "Involvement in drug subculture" predictors

The first subset of predictors examined were those variables which measured involvement in drug subculture. The final regression model for this conceptual subset found that the best predictors of the number of CIDI symptoms reported were: the number of other drugs ever tried, whether respondents had ever used for three months in a row, and the natural logarithm of the number of days in a row for which amphetamine is typically used. This model accounted for 13.7% of the variance in outcome (adjusted R^2), and the overall F test for the model ($F_{3,128}$=7.921) was significant at p=.0001. Results of the analysis are shown in Tables 20.

Table 20: Final results of linear regression of "drug involvement" predictors on number of CIDI symptoms reported

COVARIATE	coeff.	s.e.	*t*	SIG. *t*
used amphetamine daily for three months	0.80	0.36	2.21	0.029
logarithm of number of days used in a row	0.63	0.24	2.65	0.009
number of other drugs ever tried	0.20	0.08	2.44	0.016
intercept	7.76	0.85	9.1	

Interpretation of the regression coefficients for this model indicates that those respondents who *had* used amphetamine daily for three months reported experiencing, on average, 0.8 more CIDI symptoms than those respondents who *had not* used amphetamine daily. For every log unit change in the average number of days in a row for which amphetamine is administered, there was a corresponding increase of 0.6 CIDI symptoms reported. Taking the exponential of this coefficient indicates that for every extra day in a row for which amphetamine is typically used, 1.87 extra CIDI symptoms were reported. Finally, for every extra drug that a respondent reported having tried, there was a mean increase of 0.2 CIDI symptoms reported. Appendix B provides more detail on the manner in which the final model for the "drug involvement" predictors was derived.

3.9.5 "Correlates of heavy amphetamine use" predictors

The second subset of predictors from which a linear regression model was developed was those variables representing "correlates of heavy amphetamine use". The first step in these analyses was to simultaneously enter all those variables which had significant univariate relationships with the outcome variable into a regression model, in order to determine which were most predictive of the number of CIDI symptoms reported. This model accounted for 48.8% of the variance in outcome (adjusted R^2), and the overall F test for the model was significant ($F_{9,122}$=14.88, p<.0001). Those variables which were not significantly predictive of outcome were then removed, and the analysis performed again. Repeating this procedure a number of times derived the final model for this subset of variables, which accounted for 48.9% of the variance in outcome (adjusted R^2), and which was highly significant ($F_{4,127}$=32.28, p<.0001). The diagnostics obtained for the model indicated that all assumptions underlying linear regression were met. Results of this model are shown in Table 21.

Table 21: Results of the linear regression of "correlates of heavy amphetamine use" on number of CIDI symptoms reported.

COVARIATE	coeff.	S.E.	*t*	SIG. *t*
SDS score	0.25	0.04	5.92	<.001
SAmDQ total withdrawal score	0.07	0.03	2.60	.010
EPQ-R *P* score	0.08	0.03	2.46	.015
withdrawal factor 1 (psychological distress) score	0.22	0.08	2.55	.012
intercept	6.49	0.51	12.69	

Interpretation of the regression coefficients for this model indicate that, for every one unit increase in SDS score, respondents were reporting an average increase of 0.24 CIDI symptoms. For every one unit increase in SAmDQ total withdrawal score, there was a corresponding increase of 0.06 CIDI symptoms reported. For every one unit increase on the EPQ-R *P* scale, there was a corresponding increase of 0.08 CIDI symptoms reported, and for every one unit increase in the psychological distress factor of the Withdrawal Symptoms Checklist, respondents were reporting an average 0.22 increase in number of CIDI symptoms experienced.

3.9.6 The final model

The next step in the linear regression analyses was to combine the two models built up for the subsets of predictors, "drug involvement" and "correlates of heavy use". This involved taking each of the three predictors included in the final "drug involvement" model, and adding them, one at a time and in combinations, to the "correlates of heavy use" model. This seemed the most reasonable strategy, given that the "correlates" model alone accounted for almost half the variance in the outcome variable. This strategy led to the final, overall model predicting number of CIDI symptoms, which accounted for 51.3% of the variance in outcome, and was highly significant ($F_{5,126}$=28.60, p<.0001). Results of this model are shown in Table 22.

Table 22: Results of the linear regression of all predictors on number of CIDI symptoms reported.

COVARIATE	coeff.	S.E.	*t*	SIG. *t*
SDS score	0.23	0.04	5.63	<.001
EPQ-R *P* score	0.07	0.02	2.27	.025
SAmDQ total withdrawal score	0.07	0.03	2.72	.007
used amphetamine daily for 3 months	0.69	0.26	2.72	.008
withdrawal psychological distress score	0.21	0.08	2.51	.013
intercept	6.43	0.50	12.85	

Interpretation of the regression coefficients shown in Table 22, indicates that those subjects who *had* used amphetamine daily for three months at some stage reported an average of 0.69 more CIDI symptoms than those respondents who *had not* used daily for three months. For every one unit increase in SDS score, respondents were reporting an average increase of 0.2 CIDI symptoms reported, and for every one unit increase in psychological distress in withdrawal, as indexed by the summary score from the Withdrawal Symptoms Checklist, there was a corresponding increase of 0.2 reported CIDI symptoms. For every one unit increase in EPQ-R *P* scores, respondents were reporting 0.07 extra CIDI symptoms, as they were for every one unit increase in SAmDQ total withdrawal score, there was a corresponding increase of 0.07 reported CIDI symptoms.

The summary scores derived from factor analyses of the Rush Questionnaire were not used as predictors in the original regression analyses because only 68 of the sample of 132 were administered this questionnaire. In an effort to conserve power by keeping the sample size as large as possible, it was decided to derive a final overall model from the best of each of the subsets of predictors, and then to examine, in those subjects who completed it, whether the factors derived from the Rush Questionnaire explained a significant proportion of the variance in outcome on top of this final model. The final step in the linear regression analyses was to take this overall model, and to add to it the summary scores derived from factor analyses of the Rush Questionnaire, to determine whether these scores were predictive of outcome over and above those variables already in the model. None of the Rush Questionnaire summary scores were significantly predictive of number of CIDI symptoms reported, even when considered individually.

4.0 DISCUSSION

4.1 Main findings of the study

This study has provided clear evidence for a continuum of severity of amphetamine dependence, through the many significant differences in theoretically relevant variables between those individuals diagnosed as *severely* and *mild/moderately* dependent by DSM-III-R criteria. Moreover, the results have also shown that more dependent users were distinguished from their less dependent counterparts by items which assessed the negative reinforcement capacity of amphetamine. That is, as the use pattern progresses from recreational to heavy, the euphoric, energizing, confidence building effects of the drug remain important in motivating use. However, in heavy, more dependent users, other motivations, involving the drug's capacity to remove some aversive physical or emotional state, are also important.

A number of items in the demographics and drug use section of the survey were not directly relevant to the question of the relative contribution of appetitive and aversive motivation in heavy amphetamine use, but are of interest in their own right. The following sections briefly summarize these findings and their implications.

4.2 Brief summary of demographics data

The use of multiple recruitment methods and telephone screening gave rise to a diverse sample of regular amphetamine users from different socio-economic backgrounds and metropolitan regions of Sydney. In line with other studies of amphetamine users[27,40], respondents were relatively young (median age=24 years), there was a higher proportion of males than females in the sample (64.4%) and the majority of respondents were unemployed (62.9%) with correspondingly low incomes (median salary range=between A$10000 and $20000). Research has shown that provision of strong assurances to drug users that all information obtained will be treated as strictly confidential and anonymous ensures that the data are reasonably reliable and valid.[41,42] The concordance between the demographic characteristics of the present sample and those of previous studies provides evidence for the validity of the findings, a legitimate concern given that all data were based on self-reports about illegal and socially stigmatised activities.

4.3 Brief summary of drug use history data

Amphetamine use patterns were highly varied, due to the common pattern of binges followed by brief periods of abstinence, although almost one-fifth of the sample reported almost daily use over the preceding twelve months. The majority of the sample (59.8%) estimated that on average, they had used amphetamine two or three days per week during the preceding year. Most favoured injection as their primary route of administration, while a much smaller proportion administered amphetamine orally or

intranasally. Over one-third of the sample had used amphetamine every day for three months at some stage, which has major public health implications given the well-documented harms associated with heavy, chronic psychostimulant use[40].

There was a high degree of consistency in the prices respondents were paying for amphetamine, and virtually every subject considered that amphetamine was easy to obtain, the most common sources being dealers and friends. The majority of the sample considered that they were at least sometimes aware of the chemical composition of amphetamine, mainly through what their friends or dealers told them and the appearance of the drug. When asked what their amphetamine is usually cut with, most respondents suggested glucose or Epsom salts.

Not surprisingly, the majority of respondents preferred a private place in which to administer amphetamine, generally their own or a friend's place. Three-quarters of the sample would commonly stay home or do whatever they would do anyway after administering amphetamine, while a substantial proportion would go to the pub or to a gig. The prevalence of respondents who would commonly stay at home after using amphetamine would suggest that once amphetamine is administered more frequently, the social aspects of the drug are not the only motivations for use (cf. Hando and Hall[27], Ross *et al.*[40]). This is not to imply that heavier users do not have well-developed social networks of other users; indeed, 43.9% of the sample indicated that they knew between three and 20 other people who use amphetamine, and 55.3% knew more than 20 other people who use. However, it would seem that as the use pattern becomes heavier, use is no longer constrained to the social context in which initiation to amphetamine use most often takes place.

Such arguments are supported by respondents' reported reasons for continuing to use amphetamine following the first use. Over half of the sample had used amphetamine "out of habit" or to help them cope with their worries, whereas almost all respondents had used for the euphorigenic, energizing and social effects of the drug. A similar pattern emerged in responses to the MTUAQ; virtually all respondents had used amphetamine in the last twelve months to feel good, for more energy and to party and have fun, whereas just under half had used to help them cope with their worries. The overwhelming majority of the sample felt OK at least sometimes before they used amphetamine, but over three-quarters felt "lousy" at least sometimes before they used, and for a similar proportion of the sample, wanting to "escape" was at least somewhat important in their decision to use. More detailed analyses of this questionnaire showed that linear trends were evident for the aversive motivation items, in that *severely* dependent respondents were likely to report increasing frequency of amphetamine use for its negative reinforcement capacities, while *mild/moderately* dependent respondents reported decreasing frequency of use for these reasons. The appetitive motivation items were unable to distinguish between *mild/moderately* and *severely* respondents, suggesting that appetitive motivation remains an important component of use as the use pattern progresses from recreational to heavy. However, the fact that *all* five items of the MTUAQ assessing the importance of negative reinforcement in amphetamine use, yielded significantly different responses from the two groups, suggests that negative reinforcement comes to play an important role in the motivation of heavier users. It is as though these types of motivations (boredom, feeling "lousy" or "strung

out") become superimposed over the original reasons for use (the "buzz", the feeling of speeding, the energy), but that these original reasons also remain important.

It was these hedonic, euphoric, energizing effects of amphetamine that were most often nominated as the "best" things about using amphetamine, although smaller proportions of the sample reported the best things to be the ritual of scoring, mixing and injecting, that it helps one to cope with stress, and relieves boredom. The rush, nominated as the best thing by two-thirds of the sample, appeared to have some negative affect associated with it, including anxiety, anger, guilt, fear and depression. This may seem paradoxical, but qualitative insights suggested that often, such feelings are the result of feeling that one has "failed". That is, having decided to stop using amphetamine, respondents invariably injected again, so that they felt angry with themselves, guilty, depressed, and anxious and fearful that they would never be able to stop.

Withdrawal was assessed in a number of ways, including open- and close-ended items. There was a high degree of consistency in both methods, giving a relatively clear understanding of the components of the amphetamine withdrawal syndrome. Fatigue, irritability, agitation, depression, apathy, difficulty sleeping, difficulty concentrating, anxiety, aches and cramps, impaired appetite and feeling withdrawn and antisocial all appear to be symptoms which are commonly experienced following cessation of amphetamine use.

Consistent with previous studies[27,40], poly-drug use was extremely common amongst this group of regular amphetamine users, with respondents reporting experimentation with a mean of 9.1 drugs in addition to amphetamine, and injection of a mean of 3.9 drugs other than amphetamine. Respondents commonly used a number of other drugs in conjunction with, and to come down from, amphetamine. While the sample was recruited on the basis of their amphetamine use, their preferred drugs varied widely, the most popular being amphetamine, heroin and cannabis.

4.3 Psychometric analyses of the SAmDQ

Findings from the psychometric analyses of the SAmDQ were largely consistent with those reported previously[18,19], and suggest that fears that concentrating on withdrawal and withdrawal relief behaviours in assessing amphetamine dependence was inappropriate due to the nebulous nature of the amphetamine withdrawal syndrome, were largely ungrounded. Image analyses of each of the first three sections of the questionnaire (*physical withdrawal, affective withdrawal* and *withdrawal relief*) indicated that a single factor accounted for a satisfactory proportion of the variance. Further, Cronbach's alpha for each of these sections indicated adequate internal consistency, and were essentially the same as those reported by Churchill *et al.*[18] In the analyses of pooled items, a similar pattern of results to those of Churchill *et al.* were obtained, with clearly defined "withdrawal" and "withdrawal relief" factors emerging. The inclusion of the *reinstatement after abstinence* items in the analysis also led to the emergence of a third factor, "reinstatement". Thus, the findings concerning the factor structure of the first three sections of the SAmDQ are highly consistent with earlier results, and suggest that these three sections could be reduced to two, in line with the factor

structure.

Somewhat more unexpected was the superior psychometric performance of the *reinstatement* section in the present analyses. This may be, however, an artefact of the characteristics of the sample. The *reinstatement* section concerns the length of time it takes for symptoms, such as using first thing in the morning, to reemerge following first use after abstinence. However, these symptoms were not experienced by large proportions of the sample, and many respondents indicated in the *reinstatement* section that the questions were not relevant to them. There was not a "never" or "not applicable" response option available for these items; therefore, all respondents who indicated that the symptom in question was not one that they had experienced were coded for in terms of the response that was *least* indicative of dependence, based on the logic of the reinstatement after abstinence notion[1]. Proportions of the sample whose responses to the five reinstatement items were coded for in this manner ranged from 18.9% (*how long till you first felt lethargic and really tired*) to 56.8% (*how long till you were using first thing in the morning*). Moreover, 15.9% of the sample had missing data for this entire section because they had never abstained from amphetamine use for two weeks. It is possible that this restriction on the number of respondents free to vary in their responses to the *reinstatement* section (from 27.3% to 65.2%), could have contributed to its superior psychometric performance in the present analyses. The lack of variance appeared to be due to the irrelevance of the items to the sample, rather than because this was a highly dependent sample where many respondents indicated that they reexperienced symptoms almost immediately after resuming use. This suggests that the section may be displaying good reliability, with little or no validity. The *reinstatement* section has proven quite difficult, both conceptually and practically, to administer in both the SODQ[19] and the SAmDQ[18] format, and the present study was no exception. It may be that the items do not adequately operationalize this component of the dependence syndrome; or alternatively, that this element is not an essential feature of the amphetamine dependence syndrome[18]. Regardless of the reason, it was decided that the reinstatement factor should not be pursued further in the analyses.

4.4 Dependence

Level of dependence was assessed using the CIDI, which is considered to operationalize the WHO concept of the dependence syndrome. According to DSM-III-R criteria, three-quarters of the sample were *severely* dependent on amphetamine, and one-fifth were *moderately* dependent. Every CIDI symptom was reported by at least half the sample, with tolerance and withdrawal reported by virtually every subject. Examination of the symptoms in terms of the proportions of *mild/moderately* and *severely* dependent respondents who reported experiencing them revealed that significantly higher proportions of *severely* dependent respondents endorsed every symptom except tolerance, withdrawal and health problems caused or exacerbated by amphetamine. This would suggest that these symptoms are manifest in individuals located across the entire dependence continuum, whereas the others are more likely to occur in those individuals who are more severely dependent.

External validity of this notion of a continuum of dependence was provided by the many

theoretically relevant differences between *mild/moderately* and *severely* dependent respondents on a number of outcomes. There were significant differences in amphetamine use patterns, whereby *severely* dependent respondents were more likely to have used daily for three months, to have used more frequently in the preceding twelve months, to be using for more days in a row on average and to have a higher *Q* score from the OTI. *Severely* dependent respondents had also experimented with a greater number of drugs other than amphetamine. Linear trends were apparent in the SDS items, wherein higher proportions of *severely* dependent, and lower proportions of *mild/moderately* dependent, respondents were reporting increased frequency of symptoms. Results such as this suggests that psychological preoccupation is a distinguishing factor between less dependent and more dependent users, wherein, as dependence increases, so too do different aspects of preoccupation with amphetamine. This is in line with theoretical expectations, again providing support for the continuum view of amphetamine dependence.

Mean scores on the EPQ-R subscales further validate the dependence continuum notion, in that *severely* dependent respondents scored significantly higher than *mild/moderately* dependent on the subscales that theoretically, they would be expected to, namely, *addiction, criminality, psychoticism* and *neuroticism.* Moreover, summary scores derived on the bases of factor analyses of the different questionnaires, indicated that there were significant differences between the two groups in their experience of psychological distress, psychological disturbance and physical symptoms during amphetamine withdrawal, and their frequency of amphetamine use for its negatively reinforcing effects, but not for its euphoric, energizing effects. The fact that there were also statistically significant differences in the two groups' experience of the different withdrawal symptoms and withdrawal relief behaviours assessed in the SAmDQ, indicates that the questionnaire is able to discriminate between individuals with different levels of dependence, further validating the continuum notion.

4.5 Predicting severity of dependence

Finally, the results from all the different questionnaires were used as the basis for multiple linear regression analyses, in which theoretically relevant dependent variables were used to predict severity of dependence, as indexed by the number of CIDI symptoms reported. No demographic variable was related to the number of CIDI symptoms reported in univariate analyses. This may seem surprising, given, for example, that much research shows that males manifest higher rates of dependence than do females[43]. However, a possible interpretation of this pattern of results is that demographic variables such as age, gender and income may discriminate between dependent and nondependent individuals, but do not discriminate *within* these categories. That is, this was a sample of respondents specifically screened to ensure frequent use of, and by association, dependence on, amphetamine. Presumably, all subjects were therefore positioned closer to the severe end of the continuum of dependence. This restriction of range may mean that demographic variables do not distinguish well between individuals who, while differing in level of dependence, are oriented towards the severe end of the spectrum in relation to the general population. The discriminatory power of demographic variables may instead be highest when

looking at differences between nondependent, recreational drug users and dependent, frequent users. In any case, these variables were not pursued further in the analyses.

The final multiple regression model indicated that the number of CIDI symptoms reported was most closely associated with intensity of withdrawal, as measured by both the psychological distress factor derived from the Withdrawal Symptoms Checklist and the SAmDQ total withdrawal score, psychological preoccupation with amphetamine as indexed by the SDS, a history of having used amphetamine daily for three months, and "tough-mindedness" as manifested in EPQ-R *P* scores. This latter predictor is worthy of some comment. Eysenck & Eysenck[30] suggest that an individual with an high score on the *P* scale "may be described as being solitary, not caring for people; he is often troublesome, not fitting in anywhere. He may be cruel and inhumane, lacking in feeling and empathy ... hostile to others, even to kith and kin, and aggressive ... (he may have) a disregard for danger ... socialisation is a concept which is relatively alien to high *P* scorers" (p.5-6). From this description, it is theoretically relevant that heavy drug users should score more highly on this scale than both normals and their less dependent counterparts. However, it should be noted that it is impossible to infer causality from such correlational data. That is, the preexisting personality may have contributed to the drug use, or the drug use may have caused the personality profile, or both may have been caused by some extraneous variable. Moreover, it is also pertinent that the regression coefficients for both this predictor and for total SAmDQ withdrawal score indicate a 0.07 increase in the number of CIDI symptoms reported for their every one unit increase. While these results are statistically significant, their clinical utility may be doubtful due to their very small effect size on the outcome variable.

4.6 Conclusion

In conclusion, application of a structured interview schedule that aimed to assess both the positively and the negatively reinforcing effects of amphetamine in motivating heavy use, to a sample of dependent amphetamine users, has validated the existence of an amphetamine dependence syndrome that is arrayed along a continuum of severity, by demonstrating strong relationships between theoretically relevant variables, and between these variables and level of dependence. These results provide evidence that the dependence syndrome is comprised of these elements "hanging together" in the manner elucidated by Edwards *et al.*[2] The results have also shown that the appetitive motivation to use amphetamine is important to individuals located across the range of the dependence continuum, with items assessing use of amphetamine for its positively reinforcing effects unable to distinguish between respondents who were classified as *severely* and those diagnosed as *mild/moderately* dependent by the CIDI. However, individuals who are more dependent also have a whole set of other reasons for using amphetamine, that centre on the ability of the drug to remove some aversive physical or affective state. In a manner similar to opiates[44], negative reinforcement becomes more important in motivating use as the use pattern moves from recreational to heavy.

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APPENDIX A: The Amphetamine Survey Interview Schedule

Note: the Amphetamine Survey Interview Schedule also included the EPQ-R and Section L from the CIDI, but both are under copyright and have not been reporoduced. See references in Method section.

NATIONAL DRUG AND ALCOHOL RESEARCH CENTRE

UNIVERSITY OF NEW SOUTH WALES

SPEED SURVEY

Date of interview : __/__/95

Subject No. ___

SECTION 1: DEMOGRAPHICS

1. Sex:
   Male .....1 or Female 2

2. Age: _____ years

3. Suburb/town where you currently live _____
   Inner City/East 1
   North.....2
   South 3
   Inner West 4
   South West 5
   West 6
   Other 7

4. How many years of school did you complete? _____ years

5. Have you completed any courses after school?
   No 1
   Yes, trade/technical 2
   Yes, university/college 3

6. How are you employed at the moment?
   Not employed 1
   Full time 2
   Part-time/Casual 3
   Student 4
   Home duties 5

7. How much of the last year have you been unemployed?
   All of the time 1
   Most of the time 2
   Half of the time 3
   Some of the time 4
   None of the time.....5

8. How many different jobs have you had in the last year?

One.....1
Two.....2
Three 3
Four or more 4
None 5

9. What has been your main occupation in the last five years (include legal and illegal work; not working; prison etc)? Tick only one box.

TYPE OF WORK	
1. Unemployed	
2. Home duties	
3. Manager	
4. Professional eg. scientist, teacher, accountant, counsellor, artist	
5. Para-professional eg. technical officer, builder, nurse, police	
6. Tradesperson	
7. Clerical	
8. Salesperson or personal service worker eg. real estate, sales, cashier	
9. Plant or machine operator eg. road or rail driver	
10. Labourer eg. factory worker. cleaner, labourer	
11. Other eg. illegal work, prison etc (please specify)	

10. From all sources, including government, illegal sources, family etc, can you give me a rough estimate of your income for the last year?

$0 - $5000.....1
$5000 - $10000 2
$10000 - $20000 3
$20000 - $30000 4
$30000 - $40000 5
$40000 - $50000 6
$50000 or more 7

10. Who do you live with now?

Alone 1
Partner (eg. wife, boyfriend) 2
Friends 3
Family 4
With children 5

11. How many different places have you lived in the last year?

One 1
Two 2
Three 3
4 - 6 4
7 - 10 5
More than 10 6

12. How many children do you have? _____ children

13. How many of these children live with you? _____ children

SECTION 2: PSYCHOSTIMULANT AND OTHER DRUG USE

I'd like to ask you some questions about your use of speed and other drugs. Please estimate if you're not sure. Remember that the information you give me is completely confidential. Speed/amphetamine includes any type of drug used for an 'upper' effect, including pep pills, ephedrine, diet pills (eg. Duromine), some cough or cold decongestant mixtures, Ritalin, pseudoephedrine, benzedrine, methamphetamine (ice), and dexedrine. Can be pills, powder or liquid. Other, non-speed *stimulants include cocaine, ecstasy, crack and No Doz caffeine pills.*

1. How old were you when you first tried speed? _____ years

2. How old were you when you first started to use speed regularly ie. at least once a month? _____ years

3. How old were you when you first injected speed? _____ years

4. When was the last time you injected speed? .....

5. How many shots did you have on that day? .....

6. When was the last time before that that you injected speed? .....

7. How many shots did you have on that day? .....

8. And when was the time before that? .....

Q=

9. On average, how often have you used speed in the last year?
   - Every day.....1
   - Nearly every day 2
   - 2- 3 times a week 3
   - Once a week 4
   - Once a fortnight 5
   - Once a month 6
   - Less than once a month 7

10. How long have you been using at this level? .....

11. During the last year, what is the greatest number of shots of speed you have had in one day? .....

12. During the last year, what is the longest period in days that you have used speed without stopping?.....

13. During the last year, on average, how many days would you use speed without stopping? .....

For the next few questions, please tick the boxes.

	14. Which ways have you used speed?	**15. Which method did you use the first time?**	**16. Which method have you used the most overall?**	**17. Which method have you used most recently?**
1. Snort				
2. Inject				
3. Swallow				
4. Other				

18. What is the typical street value of speed? $..... per .....

19. How much did you pay for your most recent purchase? $..... per .....

20. How often do you know what type of speed you are using? (eg. whether it has been cut or not, the variety)

Never 0
Rarely.....1
Sometimes 2
Often 3
Always.....4

21. How do you know what you are using? (eg. through dealer, drug appearance, drug effects).

.....

22. What is the speed you get usually cut with?

.....

23. How do you usually get your speed? *(May circle more than one).*

Buy it from a dealer or acquaintance 1
Buy it from a pub/hotel 2
Buy it from a friend 3
Buy it from a chemist 4
Receive it from a spouse, lover, relative, friend 5
Get it from a doctor on prescription 6
Trade it for sex 7
Make it yourself 8
Other (specify).....9

24. Do you usually all use the speed yourself or do you sell some of it?

Use your speed yourself 1
Use some of it and sell some of it 2
Sell it but don't use it 3

25. How easy is it for you to get the following drugs? *(One tick per drug)*

	Don't use (1)	***Very easy (2)***	***Easy (3)***	***Hard (4)***	***Very Hard (5)***
1. Speed					
2. Cocaine					
3. Heroin					
4. Trips					

26. What are the main places you would use speed? (eg. own place, friend's place, dealer's place, public toilet, street/car park, pub/hotel, shopping malls, beach, dance parties, nightclubs, gigs, sports activites, parties etc.)

1. .....

2.....

3.....

27. Where are the main places you would go *after* you had used speed?

1.....

2.....

3.....

28. What are the three best things about using speed for you?

1.....

2.....

3.....

29. What are the three worst things about using speed for you?

1.....

2.....

3.....

30. Approximately how many people do you know (partner, friends, acquaintances, family, etc.) who use speed?

None 0
One 1
Two 2
3 - 10 3
11 - 20 4
21 - 50 5
More than 50 6

31. Can you tell me five words that you think describe what it is like to be *speeding*?

1.....

2.....

3.....

4.....

5.....

32. Can you tell me five words that you think describe what it is like to be *coming down* off speed?

1.....

2.....

3.....

4.....

5.....

Complete the following table. *(May tick more than one box)*

	33. Do you ever use other drugs while speeding?	**34. Do you ever use other drugs to come down off speed?**
1. None		
2. More speed		
3. Cocaine		
4. Ecstasy		
5. Heroin or other opiates		
6. Methadone (prescribed)		
7. Sedatives or sleeping tablets		
8. Hallucinogens (LSD)		
9. Marijuana		
10. Amyl Nitrate		
11. Other inhalants eg. glue		
12. Alcohol	More than 5 drinks per session? Y/N	
13. Tobacco		
14. Other *(specify)*		

Complete the following table *(may tick more than one box).*

MAIN REASONS	**35. For first trying speed.**	**36. For contin'g to use speed.**
1. For health reasons		
2. Because you saw other people using		
3. Because it made you feel good/for the effect/enjoyment		

MAIN REASONS ...	**35. For first trying speed**	**36. For continu'g to use speed**
4. So people would notice you		
5. It made you feel like one of the group/friends were using/acceptance		
6. Because you were bored		
7. Because you wanted to know what it was like/to try something new/curious		
8. It took away any worries that you had/helped you cope		
9. Because you were drinking alcohol/ using other drugs at the time		
10. Because you couldn't get some other drug/it's easy to get/available		
11. Because it's cheap		
12. Because you get agitated, tired or angry when you don't take it/habit		
13. To party/have fun		
14. It gives you more energy/for a lift		
15. So you won't use some other drug		
16. At work, to help you with work/uni/school		
17. Some other reaon (specify)		

37. **Drug History** (Please complete the table)

DRUG TYPE	EVER USED?	NO. DAYS USED IN LAST MONTH (ORAL AND IV)	NO. DAYS USED IN LAST 6 MONTHS: SAME PATTERN?	USE BEFORE THE LAST 6 MONTHS?	DAILY USE FOR ANY 3 MONTHS?	EVER INJECTED?
SPEED						
COCAINE						
ECSTASY						
HALLUCIN-OGENS						
AMYL NITRATE						N/A
OTHER INHALANTS						N/A
MINOR TRANQUILI-ZERS eg. Serepax, Rohypnol, Valium						
BARBITUR-ATES eg. Nembutal, Seconal						
HEROIN						
PRESCRIBE METHADON						
OTHER OPIATES eg. morphine, pethidine						
CANNABIS						N/A
ALCOHOL						N/A
TOBACCO						N/A
OTHER (SPECIFY)						

CODES: 0=NEVER 1=1-4 DAYS 2=5-8 DAYS 3=9-12 DAYS 4=13-16 DAYS 5=16-30 DAYS 6=31-50 DAYS 7=51-70 DAYS 8=70+ DAYS

38. What is your preferred drug or drug of choice?

.....

Subject No. _____

Please answer each question by circling one response only.

These questions are about how you felt about your speed use in the last year.

1. Did you ever think your speed use was out of control?

   Never or almost never.....0
   Sometimes.....1
   Often.....2
   Always.....3

2. Did the prospect of missing a fix or shot make you very anxious or worried?

   Never or almost never.....0
   Sometimes.....1
   Often.....2
   Always.....3

3. Did you worry about your speed use?

   Not at all.....0
   A little.....1
   Often.....2
   Always or nearly always.....3

4. Did you wish you could stop?

   Never or almost never.....0
   Sometimes.....1
   Often.....2
   Always.....3

5. How difficult would you find it to stop or go without?

   Not difficult at all.....0
   Quite difficult.....1
   Very difficult.....2
   Impossible.....3

Subject No. _____

For the next set of questions, please try to think about WHY you have used amphetamine over the last year, and how you feel before you use it. Please rate on the scale provided how true each of the following statements are for you.

1. I use speed for the buzz it gives me and because it makes me feel so good

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

2. I use speed because it gives me more energy and helps me stay awake

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

3. I use speed because it helps me to party and have fun

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

4. I use speed to help me with work/uni/school

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

5. I use speed because I am bored

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

6. I use speed because it helps me cope with my worries

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

7. I use speed because I can drink more, or use more other drugs, when I'm speeding

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

8. I use speed because it's cheap and easy to get

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

9. When I think about speed, it is the buzz that I think about

Never or almost never.....0
Sometimes.....1
Often.....2
Always or nearly always.....3

10. When I think about speed, it is because I feel bad and speed can help me feel better

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

11. I get strong urges to use speed because I love the buzz and the feeling of "speeding"

Never or almost never.....0
Sometimes.....1
Often.....2
Always or nearly always.....3

12. Before I use speed, I feel pretty lousy, and I know speed will help me feel better

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

13. Before I use speed I feel OK, but I know that I will feel even better if I use speed

Never or almost never 0
Sometimes.....1
Often.....2
Always or nearly always.....3

14. How important in your decision to use speed is the good time that you can have while speeding?

Not important at all.....0
Somewhat important.....1
Quite important.....2
Extremely important.....3

15. How important in your decision to use speed is the extra energy that you can get while speeding?

Not important at all.....0
Somewhat important.....1
Quite important.....2
Extremely important.....3

16. How important in your decision to use speed is wanting to "escape" from feeling bad or strung out?

Not important at all.....0
Somewhat important.....1
Quite important.....2
Extremely important.....3

AMPHETAMINE DEPENDENCE QUESTIONNAIRE

1. Which amphetamines do you usually take?

Speed ...	Bennies ...	Peaches ...
Hearts ...	Dex ...	Dexies ...
Orange ...	Crank ...	Crystal ...
Other ... (please specify)		

For the rest of the questions, please think of a typical recent period of amphetmine use.

---

2. Do you usually inject/fix?

YES NO - go straight to question 3

a. How many times do you fix during a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

b. What would be the <u>fewest</u> injections you would have during a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

c. What would be the <u>most</u> injections you would have during a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

---

3. Do you usually smoke amphetmine?

YES NO - go straight to question 4

a. How many times do you smoke during a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

b. What would be the <u>fewest</u> smokes you would have during a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

c. What would be the <u>most</u> smokes you would have during a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

---

4. Do you usually snort amphetamines?

YES NO - go straight to question 5

a. How many times do you snort during a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

b. What would be the fewest snorts you would have during a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

c. What would be the most snorts you would have during a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

---

5. Do you usually take amphetamines as a liquid or pill?

YES NO - go straight to question 6

a. How many times do you take them during a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

b. What would be the fewest times you would have them in a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

c. What would be the greatest number of times you would have them in a typical day?

0 1-2 3-4 5-6 7-8 9-10 11-12 13-14 15-16 17 or more

---

6. Does the amount of amphetamine you take vary much from day to day?

Not at all Varies a little Varies a lot

---

7. Do you find you need higher doses than you did 6 months ago for the same effect?

No Slightly higher Much higher

---

8. On wakening, and before my first dose of amphetamine:

a. My body aches or feels stiff

Never or almost never	Sometimes	Often	Always or nearly always

b. I get stomach cramps

Never or almost never	Sometimes	Often	Always or nearly always

c. I feel sick

Never or almost never	Sometimes	Often	Always or nearly always

d. I notice my heart pounding

Never or almost never	Sometimes	Often	Always or nearly always

e. I have hot and cold flushes

Never or almost never	Sometimes	Often	Always or nearly always

f. I feel miserable or depressed

Never or almost never	Sometimes	Often	Always or nearly always

g. I feel tense

Never or almost never	Sometimes	Often	Always or nearly always

h. I feel irritable or angry

Never or almost never	Sometimes	Often	Always or nearly always

i. I feel lethargic and really tired

Never or almost never	Sometimes	Often	Always or nearly always

j. I feel restless and unable to relax

Never or almost never	Sometimes	Often	Always or nearly always

k. I have a strong craving

Never or almost never	Sometimes	Often	Always or nearly always

---

9.a. I try to save some amphetamines to use on waking

Never or almost never | Sometimes | Often | Always or nearly always

9.b. I like to take my fist dose of amphetamines within two hours of waking up

Never or almost never | Sometimes | Often | Always or nearly always

9.c. In the morning, I use amphetamines to stop myself feeling sick

Never or almost never | Sometimes | Often | Always or nearly always

9.d. The first thing I think of doing when I wake up is to take some amphetamines

Never or almost never | Sometimes | Often | Always or nearly always

9.e. When I wake up I take amphetamines to stop myself aching or feeling sick

Never or almost never | Sometimes | Often | Always or nearly always

9.f. When I wake up I take amphetamines to stop myself feeling depressed

Never or almost never | Sometimes | Often | Always or nearly always

9.g. When I wake up I take amphetamines to get myself going

Never or almost never | Sometimes | Often | Always or nearly always

9.h. The first thing I do after I wake up is to take some amphetamines

Never or almost never | Sometimes | Often | Always or nearly always

---

10. Have you ever stopped using amphetamines completely <u>for at least two weeks</u>?

YES NO - questionnaire completed

a. How long after the first time you used again were you using every day?

Within 24 hours	Within a week	Within 2 weeks	Within 4 weeks	More than 4 weeks

b. How long after you started using every day did you first feel sick when you woke up?

1 day 2 or 3 days 4,5 or 6 days 7 or more days

c. How long after you started using every day did you first feel depressed?

1 day 2 or 3 days 4,5 or 6 days 7 or more days

d. How long after you started using every day did you first feel lethargic and really tired?

1 day 2 or 3 days 4,5 or 6 days 7 or more days

e. How long after you started using every day were you using first thing in the morning?

1 day 2 or 3 days 4,5 or 6 days 7 or more days

THE SPEED RUSH

Please indicate on the table below, whether you associate any of the following feelings with the ***rush*** *you get from hitting up speed. You may rate each feeling as either* ***strongly*** *associated with the speed rush,* ***weakly*** *associated with the speed rush, or* ***not associated at all.*** *Please remember we only want to know about the* ***speed rush****, not about other drugs, or speed combined with other drugs.*

FEELING	*STRONGLY ASSOCIATED WITH SPEED RUSH*	*WEAKLY ASSOCIATED WITH SPEED RUSH*	*NOT ASSOCIATED WITH SPEED RUSH AT ALL*
SATISFACTION			
WARMTH			
RELAXATION			
TIRED			
PLEASURE			
POWER			
EVERYTHING IS O.K.			
HUNGER			
ANGER			
CONTROL			
FEAR			
THIRST			
SEXUAL ORGASM			
NOT REALITY			
GUILT			
ANXIETY			
STRENGTH			
EXCITEMENT			
DEPRESSION			
THREATENED			

Please tick any of the following symptoms that you have experienced while **coming down from speed**.

fatigue or exhaustion

sweating

diarrhea

anxious

depressed

irritable

restless

trouble sleeping

vivid, unpleasant dreams

needing too much sleep

tremors (hands tremble)

stomach ache

headache

weakness

nausea or vomiting

fits or seizures

muscle aches or cramps

runny eyes or nose

yawning

intense craving

seeing or hearing things that weren't really there

heart beating fast

increased appetite

decreased appetite

fever

being slow and sluggish

lack of energy (anergy)

mental confusion

on edge

difficulty concentrating

unkeen to do anything (apathy)

feel like I can't sit still

APPENDIX B: Steps taken in deriving the final regression model for the conceptual subset of predictors, "involvement in drug subculture".

A regression model built earlier in the analyses of the "involvement in drug subculture" subset of predictors was of interest, and could reasonably have been employed as the final model; however, it was rejected on the basis of suspected multicollinearity of the independent variables. The first step taken with the subset of predictors measuring "involvement in drug subculture" was to simultaneously enter all those variables of theoretical interest, including those with nonsignificant univariate relationships with the outcome variable, into a regression model. This model accounted for 18.1% of the variance in outcome (adjusted R^2), and the overall F test of the model was significant ($F_{9,122}$=4.23, p=.0001). Those variables which were not significantly predictive of outcome were then removed, including the natural logarithm of the Q score, the number of drugs ever injected, the number of people known to the respondent who use amphetamine, and the natural logarithm of use duration. The analysis was then performed again, and the second model accounted for 19.0% of the variance in outcome (adjusted R^2). The overall F test for the model was significant ($F_{5,126}$=7.127, p<.0001). The results of this model are shown in Table 23.

Table 23: Intermediate results of linear regression of "drug involvement" predictors on the number of CIDI symptoms reported

COVARIATES	coeff.	s.e.	*t*	SIG. *t*
number of other drugs ever tried	0.17	0.80	2.13	0.035
used amphetamine daily for 3 months	1.11	0.37	3.00	0.003
use frequency: almost daily (referent)				
use 2-3 days per week	1.68	0.59	2.83	0.006
use weekly or less frequently	1.11	0.75	1.48	0.140
logarithm of number of days used in a row	1.00	0.31	3.24	0.001

Whilst this model accounted for a higher proportion of the variance than the model ultimately chosen for this subset of predictors, it was somewhat problematic because, due to the indicator form of dummy coding employed for the categorical variable of use frequency[34], the two categories of amphetamine use frequency, *2-3 days per week*, and *weekly or less* were in reference to using *almost every day*. Accordingly, the coefficients for these variables imply that respondents who use two or three days per week reported experiencing, on average, 1.7 more CIDI symptoms than those who were using almost every day, and that respondents using weekly or less, reported 1.1 more symptoms than those using almost daily. This was completely unexpected, and a pattern that was not observed in the univariate analyses, suggesting that either there was a confounding variable or some instability with the model. Multicollinearity of the

predictor variables was a potential source of instability, given that the variables chosen in this subset were strongly conceptually related. The three variables which pertained to use frequency, that is, daily use for three months, use frequency in last twelve months and average number of days in a row for which amphetamine is typically used, were moderately correlated in univariate analyses (.37 to -.69), and loaded onto the same factor in a principal components analysis, giving the possibility of multicollinearity added credence. In an effort to identify the source of instability, the tolerance and variance inflation factor (VIF) values (shown in Table 24) for each predictor were examined.

Table 24: Tolerance and VIF values for each predictor in the intermediate linear regression model of "drug involvement" variables on number of CIDI symptoms reported.

COVARIATE	TOLERANCE	VIF
number of other drugs ever tried	.934	1.071
used amphetamine daily for three months	.755	1.324
use frequency: almost daily (referent)		
use 2-3 days per week	.293	3.411
use weekly or less frequently	.258	3.883
logarithm of number of days used in a row	.459	2.177

It can be seen from Table 24 that the lowest tolerance values were those relating to the categorical variable, average frequency of use over the preceding twelve months. The tolerance values represent the proportion of variance in a variable which is *unexplained by the other predictors*, while the VIF value is equal to *1 - tolerance*.[34] Thus, the values from the above table indicate that approximately 80% and 75% of the variance in the two categories of the use frequency variable is accounted for by some combination of the other predictors in this model, which could reasonably have rendered the model and the regression coefficients unstable.

A number of different methods of overcoming this problem were examined, including calculating some index of "use severity" which took into account all three measures, but were rejected due to their arbitrary nature. Given that the three variables are conceptually strongly related, it was decided that including all three measures of use severity was not strictly necessary because the intention was to enter the best predictors from each subset, into a final, overall model. The regression analysis was performed again adding one variable at a time so as to observe when the problem of collinearity arose, and the model was observed to perform best (in terms of lack of collinearity) when the categorical use frequency variable was not included. Hence, this was the model chosen to represent the "drug involvement" subset of predictors (as shown in Table 20 of the Results section).