

Report on

A Study on the Cognitive Impairment and

Other Harmful Effects

Caused by Ketamine Abuse

Narcotics Division, Security Bureau
Hong Kong Special Administrative Region Government

February 2005

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Acknowledgements

The research team is grateful to the following agencies for their continuous support on the recruitment of participants for the study:

Caritas Youth & Community Service

Caritas Wong Yiu Nam Center

Caritas HUGS

Castle Peak Hospital Substance abuse clinic

Evergreen Lutheran Centre

Kwai Chung Hospital Substance abuse clinic

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Pamela Youde Nethersole Eastern Hospital Substance abuse clinic

Tung Wah Group of Hospital Cross Center

Special thanks are expressed to all the enthusiastic social workers from the centers listed above for encouraging participants and accompanying them for assessment.

We also express our appreciation to the efforts made by the staff of the Narcotic Division for financial and many other aspects of support for this study.

Finally, we are extremely grateful to all the participants who kindly agreed to participate in this study and permitting us to bring these findings to the scientific community and general public.

Executive Summary

1. This is a study on the harmful effects of abusing Ketamine among young people in Hong Kong. The study consists of two parts. The first part is a cross-sectional study comparing the health related outcome measures among three groups of subjects namely primarily Ketamine users, Ketamine polydrug users and non-drug user control. The second part is an in-depth qualitative study on the subjects primarily abused Ketamine. The objectives of the first part comparison study are:
 - a. To assess the physical and psychological dependence potential of abusing Ketamine, and identify their withdrawal symptoms and factors that modulate the addictive potential of Ketamine
 - b. To explore the consequential effects of Ketamine on the cognitive function of abusers
2. A total of 101 drug abusers, fulfilling the inclusion criteria¹ for the study and 26 control subjects have been recruited. Very few subjects abused only one type of drug. Most of them were polydrug users. There were 24 primarily Ketamine users, 6 primarily Ecstasy users and 71 polydrug users recruited. All the polydrug users abused Ketamine together with other psychotropic drugs. Since the number of Ecstasy was too small for meaningful statistical comparison, analysis of Ketamine abusers was focused in this study. The outcome measures were compared among primarily Ketamine group (N=24), Ketamine polydrug group (N=71) and non-drug control group (N=26).

¹ Subjects recruited should have abused the drug concerned for a frequency of at least twice a month and for a period of over six months within the past two years.

3. The average age of first Ketamine use was between 12 and 28 (16.8 on average). Abusers had taken 15 to 2000 times (366.6 times on average) of Ketamine for 6 to 81.6 months (36.6 months on average) prior to the date of assessment. Majority (74.7%) of the Ketamine users also abused other illicit drugs especially Ecstasy (94.4%).
4. About half of the Ketamine abusers (52.2%) personally preferred to take Ketamine and one-fifth (21.1%) would like Ecstasy. Other illicit drugs were less preferred.
5. Most of the subjects used the illicit drugs in disco and bar (72.3%) while some of them used at home (13.9%), at school or work place (3.2%) or even anywhere and everywhere (10.6%). They preferred to take the illicit drugs with friends (90.4%) and rarely used alone (5.3%) or with their boyfriends / girlfriends (4.3%).
6. There were 78.9% of the subjects fulfilled the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSMIV) diagnostic criteria for dependence syndrome. It took 12.7 months after first intake of Ketamine for dependence syndrome development. Moreover, 76.1% of the subjects have shown physiological dependence features (i.e. tolerance or withdrawal symptoms). Fifty-four (53.5%) of the Ketamine abusers reported withdrawal symptoms when Ketamine was stopped. The five most commonly reported withdrawal symptoms were fatigue, excessive yawning (46%); feeling irritable (38%); feeling angry,

hostile or acting aggressive (36%); sleeping difficulty (32%) and feeling depressed (32%).

7. Ketamine abusers experienced on average 11.7 times of acute intoxication. They were found to have more psychiatric disturbance than control subjects as reflected by the Brief Psychiatric Rating Scale (BPRS) total score. No statistically significant difference was noted for the health status from General Health Questionnaire (GHQ).
8. There were 26.3% in Ketamine abusers (N=95) who had life-time history of psychiatric diagnosis apart from the substance use disorders. The two commonest diagnoses were depressive disorder (12.6%) and drug induced psychosis (6.3%).
9. Regarding neurocognitive dysfunction, Ketamine abusers were found to have more soft neurological signs of motor coordination than control subjects. There was impairment in executive function with difficulty to organize their performing tasks in primarily Ketamine abusers. There was a trend of verbal memory impairment observed in drug abusers. Ketamine polydrug abusers less commonly used semantic clustering and abstract thinking in their memory strategy. However further studies with larger sample size and detailed memory assessments are required before unequivocal conclusion can be made.

10. The personality traits were assessed by using the Sensation Seeking Scale (SSS) and Barratt Impulsiveness scale (BIS). Disinhibition was found to be more marked in both primarily Ketamine and Polydrug abusers while higher experience seeking was found only in the polydrug abusers. It might indicate that disinhibition is a general vulnerability factor for drug abuse while higher experience seeking tendency would render a person to search for new drug effects from various kinds of drugs resulting in polydrug abuse.

11. The drug expectancy assessment showed that Ketamine abusers realized the negative effect of the illicit drugs, however primarily Ketamine abusers expected relaxation and tension reduction while the Ketamine polydrug abusers expected positive effects e.g. happiness, sexual potency, excitement, increased work efficiency, increased self-esteem, higher power of control etc. This might indicate that the expectation of drug effect would govern a person to try different drugs or in different combination.

12. Based on the major findings of this study, it is recommended that the dependence potential, neurocognitive impairment and psychiatric morbidity in association with Ketamine abuse should be emphasized in public education. Awareness of the health hazards related to Ketamine abuse should be increased at the community level by family physicians and drug workers. Appropriate measure should be taken for prevention, early identification and treatment of Ketamine abuse.

I: Introduction

Abuse of psychotropic drugs becomes more and more popular among young people in Hong Kong especially in the Rave culture. According to the 52th statistical report of the Central Registry of Drug Abuse (Narcotics Division 2004), 1716 drug abusers under the age of 21 were newly reported in 2002, as compared to 1,333 in 1997. It is particularly alarming in the trend of increase in Ketamine and Ecstasy abuse. The proportion of Ketamine abuse rose from 0.1% in 1997 to 72.8% in 2002, while Ecstasy abuse rose from 2.3% to 35.9% in the same period. One major concern is the prevailing view among the youngsters that these club drugs are different from heroin and thus not harmful to them. They consider taking these drugs as just a way to enhance their enjoyment in music and dancing power. They believe that the drug effect is short lasting and they can stop freely whenever they want. This is obviously contradictory to the current literature and clinical observation of the harmful effects from taking these club drugs.

Ketamine hydrochloride is arylcyclohexylamines by its chemical nature. It is a dissociative anaesthetic which produces unresponsiveness to external stimuli by dissociating various components of the mind. The pharmacological action of Ketamine is mainly contributed by its non-competitive blockade of the N-methyl-D-aspartate (NMDA) receptor in the brain. Users experience amnesia, marked analgesia and a trance-like state dissociated from the environment resulting in out-of-body or near death experience. It is popular in party and club scene because of the induced feeling of dissociation. Ketamine

has been found to induce neurotoxic reaction characterized by acute vacuolization of neurons in retrosplenial cortex in animal (Jevtovic Todorovic et al 2001). In human, Ketamine has been shown to impair dopamine system regulation (Kegeles et al 2000; Smith et al 1998), induce psychiatric symptoms similar to positive and negative symptoms of schizophrenia (Krystal et al 1994) and cognitive impairment especially the executive function and memory (Jackson et al 1992; Krystal et al 1994).

Ketamine is commonly abused together with other psychotropic drugs especially Ecstasy (3,4-methylenedioxyamphetamine; MDMA). Ecstasy is also a popular illicit drug that possesses both stimulant and mild hallucinogenic properties. Users experience a sudden, amphetamine-like rush with a feeling of euphoria and relatedness to the rest of the world. The psychomotor agitation induced can be pleasurably relieved by dancing, making it the ideal party drugs. Ecstasy was found to have neurotoxicity specifically on the serotonin system in animal (Ricaurte et al 2000) and human (McCann et al 1999; McCann et al 1998). Equivalent toxic dose in human has been estimated to be 1.28 mg/kg by the principles of interspecies scaling, which falls within the usual single dose of recreational user (1 tablet contains 50-100mg MDMA) (Ricaurte et al 2000). Clinically, Ecstasy has been found to impair mood regulation (Schifano et al 1998), impulse control (Morgan 1998), neuroendocrine function (Gerra et al 2000; Gouzoulis Mayfrank et al 2000) and cognitive function particularly memory and learning (Bolla et al 1998; Zakzanis and Young 2001).

Both Ketamine and Ecstasy long-term users have been found to develop tolerance and psychological craving for the drugs, but detailed physiological withdrawal symptoms have not been well documented (Davison and Parrott 1997; White and Ryan 1996). Moreover, the factors modulating the dependence potential have not been adequately studied. Apart from the pharmacological nature of the individual drug, risk of drug dependence is also contributed by the biological and psychological propensity of repeated drug taking of the user. Sensation seeking is a biological trait characterized by internal drive for novel and intense sensations and excitements. It has been shown that high intensity of sensation seeking is associated with high level of substance abuse and other risk-taking behaviour (Wagner 2001). Similarly, different expectation of stimulant drug effect has been associated with different patterns of illicit drug use (Aarons et al 2001). Therefore, it is expected that sensation seeking trait together with the expectation towards drug effect are the two essential factors modulating continuous use of illicit drugs including Ketamine.

In view of the rapid rise of the incidence of Ketamine abuse in Hong Kong and the misconception commonly held by the abusers and probably the general public, local empirical research data on the addictive potential, cognitive impairment and other harmful effects on the abusers of the Chinese origin is urgently needed. Moreover, recent local drug seizure revealed adulterants frequently (e.g. methamphetamine exists in Ecstasy tablet and Ketamine powder). The additional psychotropic substances are expected to potentiate the neurotoxic effects from Ketamine. Hence, the extent of such combined effect is also important for detailed study.

II: Study Objectives

- (1) To assess the physical and psychological dependence potential of abusing Ketamine, and identify their withdrawal symptoms and factors that modulate the addictive potential of Ketamine

- (2) To explore the consequential effects of Ketamine on the cognitive function of abusers

III: Study Hypothesis

- (1) Ketamine has additive potential with development of tolerance, physiological withdrawal symptoms, craving and other clinical dependence features
- (2) High sensation seeking and positive expectancy of drug effect increase the risk of continuous use of Ketamine
- (3) Ketamine abuse impairs cognitive function especially learning, memory and executive function
- (4) Ketamine abuse causes harmful effects on physical and mental health (especially anxiety, depression, impulsivity, self-harm, aggression and psychosis); school & work performance; family and interpersonal relationship; financial and judicial status
- (5) Combination of Ketamine and other psychotropic drugs (e.g. Ecstasy and methamphetamine) is more dangerous than primarily Ketamine use with reference to cognitive impairment and harmful effects.

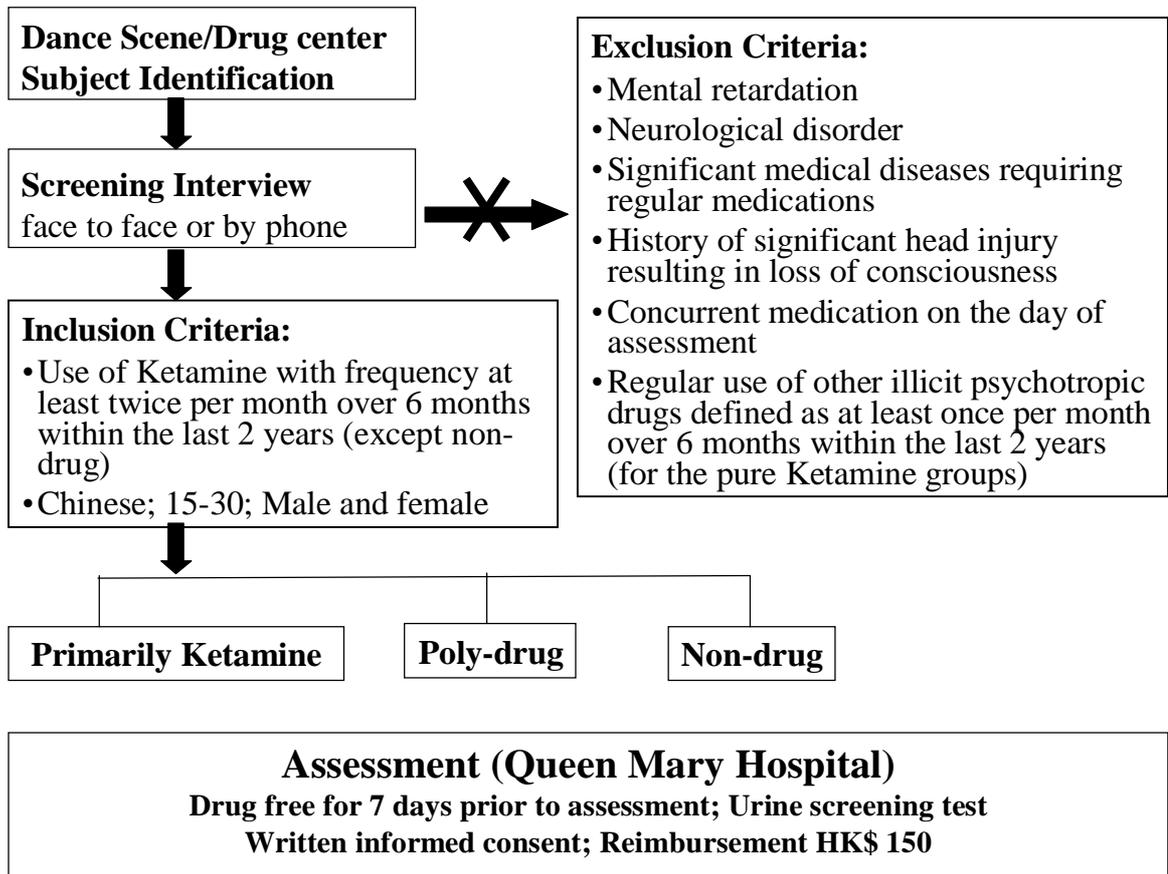
IV: Study Methodology

(1) Design:

This is a cross-sectional between-group comparison study. Participants with history of Ketamine abuse were recruited for comparing their outcome measures with the participants without drug abuse history. The participants with drug abuse were assigned to two drug abuse groups according to their drug taking pattern defined as follows. The definition was commonly used in studies on drug abuse (Daumann et al 2001; Gouzoulis Mayfrank et al 2000). The control group consisted of subjects who had no previous history of drug abuse.

- a. Primarily Ketamine group (defined as use of Ketamine with frequency at least twice per month over 6 months within the last 2 years and no other illicit psychotropic drug use up to once per month over 6 months within the last 2 years)
- b. Ketamine Poly-drug group (defined as use of Ketamine and, together with other illicit psychotropic drugs, e.g. Ecstasy and/or methamphetamine, with frequency at least twice per month over 6 months within the last 2 years)
- c. Control group (defined as no history of drug abuse)

Diagram 1: Overall Research Design



(2) Recruitment:

Drug user participants were recruited from the dance scene or drug centers. Non-drug control participants matched for age were recruited from dance scene and general public.

(3) Inclusion criteria:

- a. Use of Ketamine or Ketamine mixed with other psychotropic drugs with frequency at least twice per month over 6 months within the last 2 years
- b. Chinese
- c. Age: 15-30
- d. Male and female

(4) Exclusion criteria:

- a. Mental retardation
- b. Neurological disorder
- c. Significant medical diseases requiring regular medications
- d. History of significant head injury resulting in loss of consciousness
- e. Concurrent medication on the day of assessment
- f. Regular use of other illicit psychotropic drugs defined as up to once per month over 6 months within the last 2 years (for the primarily Ketamine groups)

(5) Sociodemographic information:

The following background information was recorded.

- a. Age
- b. Gender
- c. Education level
- d. Occupational status
- e. Number of siblings
- f. Marital status
- g. Parents marital status
- h. Monthly family income
- i. Religious background
- j. Family history of substance abuse and psychiatric illness

(6) Clinical assessment:

6.1 Customary Drinking and Drug Use Record (CDDR) (Brown et al 1987)

This rating instrument has been used by our research team. It is considered to be a good instrument to assess the level of drug use, especially the detailed dependence features, which is one of the major objectives of this study. This rating scale provides current (last 3 months) and lifetime measure of four alcohol and other drug related domains.

- a. Level of involvement
- b. Withdrawal characteristics
- c. Psychological / behavioural dependence symptoms
- d. Negative consequences

6.2 Structured Clinical Interview for DSM-IV (First et al 1998a; First et al 1998b; Kam et al 2000; So et al 2003; So et al In Press)

This is a standard and commonly used instrument for making DSM IV psychiatric diagnosis of psychiatric patients and screening for psychiatric illness in non-psychiatric population. It has been validated in Hong Kong Chinese.

6.3 Brief psychiatric rating scale (Overall and Gorham 1962)

This is a commonly used rating scale for the assessment of psychiatric symptoms including psychotic symptoms. It has been commonly applied in the Chinese population (Chan and Lai 1993; Chen et al 1996).

6.4 General Health Questionnaire 60 items (Chan 1985; Goldberg 1978)

This is a rating scale for assessing the severity of non-psychotic psychiatric disturbance. The Chinese version has been validate in Hong Kong and commonly used in various research settings. It consists of six factors.

- a. General illness
- b. Somatic symptoms
- c. Sleep disturbance
- d. Social dysfunction
- e. Anxiety and Dysphoria
- f. Severe depression

6.5 Barratt Impulsiveness scale (BIS) (Barratt 1985)

This rating scale is used to assess the intensity of impulsivity in the following domains. It has been validated in local Chinese (Chan et al 2003).

- a. Attentional impulsiveness
- b. Motor impulsiveness
- c. Non-planning impulsiveness

6.6 Sensation seeking scale revised form V (Zuckerman 1994)

This is a rating scale for the assessment of sensation seeking in four subscales. It has been translated into Chinese and validated in the Chinese population (Tang et al 1996).

- a. Thrill and Adventure Seeking
- b. Experience Seeking
- c. Disinhibition
- d. Boredom Susceptibility

6.7 Stimulant expectancy questionnaire (Aarons et al 2001)

This is used to assess the following domains according to the participant's beliefs and expectation about the stimulant drug they know best. This instrument is being validated by our research team.

- a. Global positive effects
- b. Global negative effects
- c. General arousal
- d. Relaxation and tension reduction

7 Cognitive assessment:

7.1 General Intellectual ability

The Wechsler Adult Intelligence Test – III (Wechsler 1997) Short-form was used to give an estimate of participants' intellectual ability. This has been used widely in local Chinese subjects by our research team (Chen et al submitted).

7.2 Attention

a. The Sustained Attention to Response Task (Robertson et al 1997)

This computer test consists of 225 visually presented digits (25 of each of the nine digits) over a 4.3-min period. Participants are requested to respond to each digit, except the digit 3, as accurate and fast as possible. This has been validated in local Chinese subjects (Chan et al 2004b).

b. The Stroop Test (Perret 1974)

This is a commonly used test of selective attention. Subjects are required to name the color in which words of color names are printed. It is expected that the semantic content of the word will interfere with the color-naming task.

7.3 Memory

- a. Hong Kong Learning List (Chan and Kwok 1999) for immediate and delayed recall, and learning.

- b. Letter-Number Span test (Wechsler 1997)

This is a test for verbal working memory. A series of letters and numbers are orally presented to participants in a mixed-up order. They are requested to say the numbers first in ascending order and then the letters in alphabetical order. The longest correct sequence recalled by the participants will be recorded. This has been commonly used in our laboratory (Chan et al 2004a).

7.4 Executive function

- a. The Modified Wisconsin Card Sorting Test (Nelson 1976)

The test is mainly designed to assess one's ability to shift or switch attention between sets of tasks. It requires participant to sort cards that show stimuli varying along three perceptual dimensions (colour, number and shape) according to a rule that one of the dimensions is correct. It has been used in local Chinese subjects by our research team (Chan and Chen in press).

- b. The Modified Six Elements Test (Wilson et al 1996)

The test consists of three tasks (simple arithmetic, written picture naming, and dictation). Each of which has two parts. The participant is required to attempt at least part of each of the six sub-tasks within 10 minutes, following the rule that s/he is

unable to switch directly from a sub-task of one type to the counterpart of that type. It has been validated in local Chinese (Chan et al 2004c; Chan and Manly 2002)

c. The Verbal Fluency Test (Benton 1968)

Participants are requested to name as many exemplars as they can from the category of 'animal' within 1 minute. This test has been widely used in local Chinese (Chan and Chen 2003; Chen 1994).

7.5 Neurological signs

a. Blink Rate (Chen and Chan 2004)

It is a test for counting the blink frequency within 2 minutes.

b. Cambridge Neurological Sign Inventory (Chen et al 1995)

It is standardized test for assessing 7 subgroups of neurological signs, including motor coordination, sensory integration, extra-pyramidal signs, dyskinesia, catatonia, disinhibition, and pyramidal signs.

8 Procedures:

Participants of drug abuser and non-drug control were recruited from the dance scenes, drug center and the general public in Hong Kong. They were briefly interviewed by an investigator for history of substance abuse and their verbal consent for further screening interview and subsequent assessment. The consented participants were invited for a screening interview to screen for inclusion and exclusion criteria by phone or face-to-face interview. Suitable participants were arranged another interview for assessment. They were advised to stop taking illicit drug 7 days prior to the assessment day. On the day of assessment, written informed consent was obtained and each participant was reimbursed HK\$150 for their traveling and meal expenses. Urine was collected for drug screening to confirm recent drug abstinence. Those participants with positive drug detection in urine was excluded and reassessed after 7 days of drug abstinence. Participants complete the self-rating clinical instruments and subsequently interviewed by a research psychiatrist (RYL Chen) for other clinical ratings. At the end, the cognitive function of each participant was examined by a research assistant (KWC Chum) using a battery of neuropsychological tests.

9 Blindness:

The investigator scoring for the psychometric tests was blinded to the group membership of the participants and their level of drug use.

10 Statistical analysis:

Multivariate analysis of variance was used to analyse the group difference effects on the clinical and psychometric scores. Scores were correlated to the extent of Ketamine and Ecstasy use. Factors like sensation seeking and drug expectancy were assessed for the association of continued drug use. All the statistical analyses were computed by using the SPSS for windows version 12.0 software in an IBM compatible personal computer.

V: Results

1. Sample Description:

We have recruited 101 drug abusers and 26 normal controls. Ninety-five drug abusers had history of Ketamine use. Twenty-four of them were classified as primarily Ketamine users according to the research criteria (i.e. use of Ketamine with frequency at least twice per month over 6 months within the last 2 years and no other illicit psychotropic drug use up to once per month over 6 months within the last 2 years). Seventy-one was considered as polydrug abusers who abused Ketamine together with other illicit drugs which include Ecstasy, Marijunana, Methamphetamine, Cocaine, Cough Mixture, Zopiclone, Nimetazepam and other Benzodiazepines. Among the polydrug abusers, 15 abused both Ketamine & Ecstasy; 52 abused Ecstasy and some other illicit drugs in addition to Ketamine and 4 abused other illicit drugs without Ecstasy. There were only 6 subjects who abused Ecstasy only. Therefore Ketamine was common and most of them would also use other illicit drugs. Ecstasy was very rarely used alone.

The analysis was focused on the patterns of Ketamine use and its harmful effects. The recruited subjects were divided into three groups namely Healthy Control (C), primarily Ketamine (K) and Ketamine polydrug (K+) (i.e. Ketamine with other illicit drugs) for statistical analysis. The 6 primarily Ecstasy subjects were excluded from the statistical analysis.

2. Demographic information:

The demographic information of the three groups is shown in Table 1. Control subjects were found to have slightly higher education level than the drug abusers. More female was found in Control group. K+ group had higher rate of unemployment and less student status despite similar age among the three groups. More criminal records were found in the drug abusers as compared to control subjects. Most (67.7%) of the criminal record in the K+ group was non-drug related while 46.2% was found in K group. No statistical difference was found in age, marital status, religious belief, family history of mental illness, alcoholism and substance abuse among the three groups.

Table 1: Demographic Information of Control Subjects and Ketamine Abusers

	C	K	K+	Statistics	P
Age	19.2 (3.1)	20.5 (3.7)	20.0 (3.1)	F=1.06	0.350
Sex M	46.2%	70.8%	78.9%	X ² =9.75	0.008
F	53.9%	29.2%	21.1%		
Education (yrs)	11.0 (1.51)	9.5 (1.45)	9.0 (1.21)	F=20.88	<0.001
Marital status:					
Single	100%	100%	100%		
Occupation:					
Employed	30.8%	58.3%	53.5%	X ² =37.69	<0.001
Student	65.4	25.0%	8.5%		
Unemployed	3.9	16.7%	38.0%		
Religion:					
No	73.1	69.6%	74.7	X ² =0.14	0.933
Yes	26.9%	30.4%	25.4		
Criminal Record ^ψ					
No	96.2%	45.8%	50.0%	X ² =18.92	<0.01
Yes	3.9	54.2	50.0%		
Family Hx Mental Illness:					
No	96.2%	91.7%	92.9%	X ² =0.47	0.793
Yes	3.9%	8.3%	7.1%		
Family Hx Alcoholism:					
No	92.3%	83.3%	80.0%	X ² =2.07	0.356
Yes	7.7%	16.7%	20.0%		
Family Hx Drug Abuse:					
No	96.2%	87.5%	91.4%	X ² =1.24	0.539
Yes	3.9%	12.5%	8.6%		

C=control subject; K= primarily Ketamine users; K+= users of Ketamine and other illicit drugs; Standard deviation in brackets; ^ψNon-drug related criminal record (Control=100%; K=46.2%; K+=67.7%)

3. Pattern of Ketamine Use:

The patterns of drug use from the 95 recruited Ketamine abusers are shown in Table 2. The age for their first Ketamine use was 16.8 year with an average duration of use as 36.6 months (range: 6-81.6). On average, they have ever used Ketamine for 366.6 times (range: 15-2000). It shows that majority (74.7%) of the subjects also used other illicit drugs in addition to Ketamine. When they used other illicit drugs, Ecstasy was most commonly used (94.4%). Among the Ketamine abusers, about half of them (52.2%) would personally prefer to take Ketamine and one-fifth (21.1%) would like Ecstasy. Other illicit drugs were less preferred. Most of the subjects used the illicit drugs in disco and bar (72.3%) while some of them used at home (13.9%), at school or work place (3.2%) or even anywhere and everywhere (10.6%). They preferred to take the illicit drugs with friends (90.4%) and rarely used alone (5.3%) or with their boyfriends / girlfriends (4.3%). In the assessment of their attitude towards the likelihood of continuous illicit drug use, they commonly held ambivalent attitude expressing somewhat likely for future use.

Table 2: Patterns of Ketamine Use (N=95)

	K
Onset age (year)	16.8(3.1)
Frequency (times ever used)	366.6 (424.6)
Duration of use (months)	36.6 (15.0)
Drug combination (no. of subjects)	
Ketamine only	24
With Ecstasy	15
With Ecstasy & Others*	52
With Others without Ecstasy	4
Drug preference	
Ketamine	52.2%
Ecstasy	21.1%
Marijunana	13.3%
Methamphetamine	5.6%
Cough mixture	4.4%
Cocaine	1.1%
Nimetazepam	1.1%
Zopicone	1.1%
Place for drug use	
Disco or bar	72.3%
Home or friend's house	13.9%
Anywhere and everywhere	10.6%
School or work place	3.2%
Whom to use	
Friends	90.4%
Alone	5.3%
Partner or boyfriend or girlfriend	4.3%
Likelihood of Future Use ^ψ	5.0 (3.1)

Onset= age of first Ketamine use; Standard deviation in brackets

*include Marijunana, Methamphetamine, Cocaine, Cough mixture, Zopicone, Nimetazepam and other Benzodiazepines

^ψ Likert scale: 1=very unlikely; 5=somewhat likely, 10=very likely

4. Ketamine Acute Intoxication and Dependence Syndrome:

From the whole group of Ketamine abusers (N=95), they experienced on average 11.7 times (sd=27.7) of acute intoxication. There were 78.9% of the subjects who fulfilled the DSMIV diagnostic criteria for dependence syndrome. It took 12.7 months (sd=9.3) after first intake of Ketamine for development of dependence syndrome. Moreover, 76.1% of the subjects have shown physiological dependence features (i.e. tolerance or withdrawal symptoms). Fifty-four (53.5%) of the subjects (N=95) reported withdrawal symptoms when Ketamine was stopped. However, 4 could not be certain about the drug causing the withdrawal symptoms due to other concomitant drugs use. When only the primarily Ketamine group (N=24) was analysed, same proportion of subjects (54.2%) reported withdrawal symptoms. Therefore the withdrawal symptoms attributed to Ketamine reported by all the Ketamine abusers were combined and listed in Table 3. The five most commonly reported withdrawal symptoms were fatigue, excessive yawning (46%); feeling irritable (38%); feeling angry, hostile or acting aggressive (36%); sleeping difficulty (32%) and feeling depressed (32%). When only the primarily Ketamine users were analysed, the five most commonly reported withdrawal symptoms were the same; i.e. fatigue, excessive yawning (53.8%); feeling irritable (53.8%); feeling angry, hostile or acting aggressive (46.2%); sleeping difficulty (46.2%) and feeling depressed (46.2%). On the day of assessment, the participants did not report any sign and symptom of drug withdrawal.

Table 3: List of withdrawal symptoms attributed to Ketamine from subjects of both primarily Ketamine and Ketamine Polydrug groups (N=50)

Withdrawal Symptoms	Rate of occurrence
Fatigue, excessive yawning	46%
Feeling irritable	38%
Feeling angry, hostile or acting aggressive	36%
Sleeping difficulty, such as taking more than 30 minutes to fall asleep	32%
Feeling depressed	32%
Increased dreaming	30%
Shaking of hands, tongue or eyelids	30%
Runny nose	24%
Feeling anxious or nervous	18%
Stomach upset, nausea or vomiting	14%
Quick or rapid breathing, heart racing or pounding	14%
Confusion (difficulty understanding what people are saying or getting directions mixed up)	14%
Forgetfulness, difficulty remembering things	14%
Muscle aches, pains or weaknesses	10%
Feeling weak or faint when standing up (decreased blood pressure)	10%
Loss of appetite	10%
Teary eyes	8%
Excessive / heavy sweating	8%
Diarrhea (frequent and watery bowels)	4%
Thoughts that someone was after you or out to get you (felt paranoid)	4%
Hair standing up	2%
Hearing or seeing things that don't exist (hallucinations)	2%
Nose bleeding	2%
Eyes dilated	0%
Fever	0%
Thought you were a very important person (delusion)	0%
Confused about who you are, where you are or what time/date/year (disorientation)	0%
Convulsions / seizures	0%

5. Physical and Mental Health Status

The general health status including physical and mental were assessed by using General Health Questionnaire (GHQ). The psychiatric disturbance including psychotic symptoms, mood and anxiety were assessed by using the Brief Psychiatric Rating Scale (BPRS). The results are shown in Table 4. Ketamine abusers were found to have more psychiatric disturbance than control subjects as reflected by the BPRS total score. No statistically significant difference was noted for the health status from GHQ.

6. Co-morbid Psychiatric Disorders

There were 26.3% in Ketamine abusers (N=95) who had life-time history of psychiatric diagnosis apart from the substance use disorders. The list of psychiatric diagnosis is shown in Table 5.

Table 4: Physical and Mental Health Status of Ketamine Abusers

Items	C N=26	K N=24	K+ N=71	Effect Size (f)	Statistics*	Significance	Group Effect ^ψ		
	Mean (sd)	Mean (sd)	Mean (sd)				C vs K	C vs K+	K vs K+
BPRS (total score)	20.1 (3.3)	27.1 (6.9)	26.5 (8.0)	0.42	F=8.92	P<0.001	P=0.002	P<0.001	P=1.00
GHQ (total score)	105.3 (15.7)	115.4 (31.1)	112.9 (25.1)	0.14	F= 0.20	P=0.304	NA	NA	NA

C=control subject; K= primarily Ketamine users; K+= users of Ketamine and other illicit drugs; sd: standard deviation; f: effect size index; NA: not applicable; *ANOVA test; ^ψ Post-hoc multiple comparison with Bonferroni test

All statistical tests are two tailed with significant level at $p<0.0251$ and trend level at $0.00251 \leq p < 0.05$

Table 5: Co-morbid Psychiatric Disorders in Ketamine Abusers

Psychiatric diagnosis	Rate of occurrence
Depressive disorder	12.6%
Drug induced psychosis	6.3%
Phobic anxiety disorder	4.2%
Bipolar affective disorder	1.1%
Adjustment disorder	1.1%
Cyclothymia	1.1%
Binge eating disorder	1.1%
Multiple personality disorder	1.1%

7. Neurocognitive Dysfunction of Ketamine Abusers:

Educational level is the most determining factor for the performance of neurocognitive function. Since there was difference in educational level between the drug abusers and control subjects, the analysis of the neurocognitive test scores were controlled for the educational level. Moreover, the gender effect was also controlled in the analysis in view of the difference in gender proportion among the three groups.

The soft neurological signs were captured by using the Cambridge Neurological Inventory. The results are shown in Table 6. The result shows that primarily Ketamine users had significantly more neurological deficit in motor coordination than control subjects ($P < 0.001$) and a trend of more impairment as compared to Ketamine polydrug abusers ($P = 0.003$). The cognitive function was assessed by using a battery of neuropsychological tests for several domains including general intelligence, attention and vigilance, executive function and memory. There was impairment of executive function as reflected from the Six Element Test in which primarily Ketamine users had more difficulty to organize their performing tasks. Concerning the verbal memory test, drug abusers showed a trend of poorer performance in word list learning ($P = 0.076$) and 30 minutes delayed in word list recall ($P = 0.062$) while the number of errors was the same as control subjects. Further assessment of their memory strategy showed that Ketamine polydrug abusers less commonly used semantic clustering ($P = 0.026$) as their memory strategy. Moreover they had more difficulty to memorize abstract items ($P = 0.039$). There was only a trend of poorer performance in information domain as a test for the general

knowledge in the Ketamine polydrug users ($P=0.037$). No difference was noticed in the other subtests of general intelligence as well as other neurocognitive domains including attention and vigilance among the three groups.

8. Expectation of Drug Effect

The expectation of drug effect was assessed by the Stimulant Expectancy Questionnaire (SEQ). The result is shown in Table 7. Primarily Ketamine users had higher expectation on relaxation and anxiety reduction while the Ketamine polydrug users expected more on the global positive effect which includes happiness, sexual potency, excitement, increased work efficiency, increased self-esteem, higher power of control etc.

9. Personality traits

The personality traits were assessed by using the Sensation Seeking Scale (SSS) and Barratt Impulsiveness scale (BIS). The results are shown in Table 8. Users of Ketamine and other illicit drugs were found to have higher tendency to seek for new experience and have disinhibition.

Table 6: Comparison of Neurocognitive Function Between Ketamine Abusers and Controls

Items	C	K	K+	Effect Size (f)	Statistics*	Significance	Group Effect ^w		
	N=26	N=24	N=71				C vs K	C vs K+	K vs K+
	Mean (sd)	Mean (sd)	Mean (sd)						
Soft signs:									
Motor coordination	0.5 (1.1)	4.5 (3.8)	2.7 (2.9)	0.46	F=11.03	P<0.001	P<0.001	P=0.148	P=0.003
Sensory integration	0.5 (1.3)	2.7 (2.9)	1.7 (2.2)	0.32	F=1.92	P=0.151	NA	NA	NA
Parkinsonism	0.04 (0.2)	0.5 (0.9)	0.3 (0.7)	0.22	F=2.33	P=0.102	NA	NA	NA
Disinhibition	0.4 (0.8)	0.7 (0.9)	0.5 (0.9)	0.11	F=1.04	P=0.357	NA	NA	NA
Catatonia	0.0 (0.0)	0.04 (0.2)	0.0 (0.0)	0.13	F=0.81	P=0.449	NA	NA	NA
Blink rate	32.2 (20.2)	32.0 (23.4)	29.7 (19.1)	0.06	F=0.23	P=0.798	NA	NA	NA
General intelligence:									
Information	14.0 (5.5)	9.8 (3.4)	9.7 (4.0)	0.40	F=3.36	P=0.038	0.174	0.037	1.000
Arithmetic	14.6 (3.2)	13.0 (2.9)	12.9 (3.1)	0.22	F=0.32	P=0.969	NA	NA	NA
Digit span	90.2 (14.3)	80.2 (17.6)	84.4 (15.7)	0.20	F=0.78	P=0.462	NA	NA	NA
Block design	52.6 (9.2)	46.5 (8.3)	49.0 (10.3)	0.21	F=0.57	P=0.570	NA	NA	NA
Attention & Vigilance:									
Continuous Performance Test									
Correct response	28.0 (9.4)	23.6 (7.1)	26.8 (9.9)	0.17	F=2.03	P=0.137	NA	NA	NA
Commission error	0.3 (1.0)	0.4 (0.9)	0.2 (0.8)	0.09	F=2.49	P=0.087	NA	NA	NA
Omission error	0.4 (0.6)	1.3 (1.7)	1.2 (1.8)	0.23	F=1.21	P=0.302	NA	NA	NA
Stroop color task									
Correct response	106.8 (19.6)	110.0 (2.6)	110.2 (2.4)	0.12	F=2.59	P=0.080	NA	NA	NA
Incorrect response	0.4 (0.7)	0.7 (1.1)	0.7 (1.3)	0.12	F=0.63	P=0.534	NA	NA	NA
Stroop color-word task									
Correct response	93.7 (16.2)	87.0 (19.9)	92.9 (17.8)	0.14	F=2.44	P=0.092	NA	NA	NA
Incorrect response	2.4 (2.5)	2.9 (3.6)	2.4 (2.5)	0.07	F=1.23	P=0.297	NA	NA	NA

Table 6 Cont.: Comparison of Neurocognitive Function Between Ketamine Abusers and Controls

Items	C N=26	K N=24	K+ N=71	Effect Size (f)	Statistics*	Significance	Group Effect ^ψ		
	Mean (sd)	Mean (sd)	Mean (sd)				C vs K	C vs K+	K vs K+
Executive function:									
Wisconsin Card Sorting Test									
Category completed	5.8 (0.5)	5.0 (1.9)	5.0 (1.7)	0.22	F=0.90	P=0.409	NA	NA	NA
Perseverative error	1.2 (1.9)	2.2 (2.8)	2.3 (4.2)	0.14	F=1.31	P=0.275	NA	NA	NA
Verbal Fluency Test									
Correct response	20.1 (3.5)	18.7 (4.0)	18.8 (4.4)	0.14	F=0.33	P=0.721	NA	NA	NA
Incorrect response	0.08 (0.3)	0.05 (0.2)	0.01 (0.1)	0.13	F=0.59	P=0.555	NA	NA	NA
Six Element Test									
Task completed	5.7 (0.7)	5.7 (0.6)	5.2 (1.2)	0.28	F=1.51	P=0.227	NA	NA	NA
Rule break	0.2 (0.5)	1.2 (1.3)	0.3 (0.8)	0.40	F=7.09	P=0.001	P=0.005	P=1.000	P=0.002
Verbal memory:									
Letter-number test	15.5 (3.8)	13.1 (2.1)	13.7 (3.2)	0.27	F=0.70	P=0.500	NA	NA	NA
HK List Learning									
Learning	12.2 (2.2)	9.9 (2.5)	9.8 (2.5)	0.41	F=2.64	P=0.076	NA	NA	NA
Error	0.5 (0.9)	0.9 (1.8)	0.8 (1.3)	0.10	F=1.22	P=0.298	NA	NA	NA
30 min delayed recall	10.7 (2.3)	7.5 (2.7)	7.8 (3.1)	0.45	F=2.86	P=0.062	NA	NA	NA
Recognition	15.2 (0.9)	14.2 (1.4)	14.0 (2.0)	0.32	F=0.62	P=0.541	NA	NA	NA
Semantic clustering	4.3 (2.3)	2.7 (1.8)	2.4 (1.9)	0.38	F=3.60	P=0.031	P=0.268	P=0.026	P=1.000
Abstract	6.2 (1.5)	4.9 (1.5)	4.7 (1.4)	0.41	F=3.20	P=0.045	P=0.336	P=0.039	P=1.000

C=control subject; K= primarily Ketamine users; K+= users of Ketamine and other illicit drugs; sd: standard deviation; f: effect size index; NA: not applicable; *ANOVA test controlled for education level; ^ψ Post-hoc multiple comparison with Bonferroni test; All statistical tests are two tailed with significant level at $p < 0.0016$ and trend level at $0.0016 \leq p < 0.05$

Table 7: Expectation of Drug Effects

Items	C	K	K+	Effect Size (f)	Statistics*	Significance	Group Effect ^ψ		
	N=26	N=24	N=71				C vs K	C vs K+	K vs K+
	Mean (sd)	Mean (sd)	Mean (sd)						
Global positive affect	40.1 (6.4)	42.8 (6.8)	46.3 (8.7)	0.35	F=6.39	P=0.002	P=0.687	P=0.002	P=0.0204
Global negative affect	56.2 (7.7)	56.6 (6.4)	55.9 (8.5)	0.04	F=0.07	P=0.931	N.A.	N.A.	N.A.
General arousal	26.1 (5.0)	26.7 (5.0)	28.1 (4.7)	0.18	F=2.05	P=0.134	N.A.	N.A.	N.A.
Relaxation and tension reduction	10.7 (2.2)	13.0 (2.5)	11.9 (2.3)	0.32	F=5.99	P=0.003	P=0.002	P=0.114	P=0.110

C=control subject; K= primarily Ketamine users; K+= users of Ketamine and other illicit drugs; sd: standard deviation; f: effect size index; NA: not applicable; *ANOVA test controlled for education level; ^ψ Post-hoc multiple comparison with Bonferroni test; All statistical tests are two tailed with significant level at $p < 0.0125$ and trend level at $0.0125 \leq p < 0.05$

Table 8: Personality Traits of Ketamine Users

Items	C	K	K+	Effect Size (f)	Statistics*	Significance	Group Effect ^ψ		
	N=26	N=24	N=71				C vs K	C vs K+	K vs K+
	Mean (sd)	Mean (sd)	Mean (sd)						
Sensation seeking scale									
Thrill & adventure seeking	5.9 (2.6)	6.0 (2.6)	6.2 (2.6)	0.05	F=0.14	P=0.868	NA	NA	NA
Experience seeking	3.7 (1.5)	4.6 (1.5)	4.8 (1.6)	0.29	F=5.60	P=0.005	P=0.112	P=0.003	P=1.000
Disinhibition	4.0 (1.9)	5.7 (2.4)	6.3 (2.0)	0.43	F=12.8	P<0.001	P=0.010	P<0.001	P=0.691
Boredom susceptibility	3.6 (1.8)	3.2 (1.6)	3.3 (1.6)	0.08	F=0.29	P=0.748	NA	NA	NA
Barratt impulsivity scale									
Non-planning	25.8 (3.5)	24.9 (3.4)	24.4 (3.5)	0.16	F=1.61	P=0.204	NA	NA	NA
Motor	21.7 (3.2)	23.4 (3.8)	23.2 (3.5)	0.18	F=1.98	P=0.143	NA	NA	NA
Attentional	16.6 (1.9)	17.3 (3.3)	17.6 (2.7)	0.15	F=1.28	P=0.282	NA	NA	NA

C=control subject; K= primarily Ketamine users; K+= users of Ketamine and other illicit drugs; sd: standard deviation; f: effect size index; NA: not applicable; *ANOVA test controlled for education level; ^ψ Post-hoc multiple comparison with Bonferroni test; All statistical tests are two tailed with significant level at $p < 0.007$ and trend level at $0.007 \leq p < 0.05$

10. Level of Ketamine use in relation to Harmful Effects:

We performed an explorative analysis of the relationship between the level of Ketamine use (i.e. frequency and duration of use) and the identified harmful effects (i.e. dependence syndrome, BPRS, motor coordination, number of rule break in the Six Element Test, and semantic/abstract memory in HK learning list). Only the primarily Ketamine group was analysed because the harmful effects would be influenced by the concomitant drugs. The frequency and duration of Ketamine use were compared between subjects with or without dependence syndrome (Table 9). It was found that subjects with dependence syndrome had significantly higher frequency of Ketamine consumption. Partial correlation controlled for education was used for analysis of the other outcome measures. Our results showed that the higher the frequency of Ketamine use, the more impairment was in abstract memory ($r=-0.51$; $p=0.03$).

Table 9: Level of Ketamine use and Dependence Syndrome

	Non-dependent (N=6)	Dependent (N=18)	Statistics*	Significance
Frequency (times ever used)	84.2 (65.7)	499.4 (601.3)	T=2.88	P=0.01
Duration (months)	32.1 (28.0)	37.7 (12.8)	T=0.69	P=0.500

*t-test; two tailed with significant level at $p<0.025$ and trend level at $0.025 \leq p < 0.05$

11. Social Background in Relation to Ketamine Harmful Effects:

We investigated whether the socio-demographical information would explain the severity of harmful effects from Ketamine use. Regression analysis was performed with Education, Occupation, Family Income, Criminal Record as independent variables to explain the identified harmful effects (i.e. dependence syndrome, BPRS, motor coordination, sensory integration, number of rule break in the Six Element Test, learning and semantic/abstract memory in HK learning list). However, no significant finding was noted.

12. Subjects Primarily Abused Ketamine:

Majority of the drug abusers would take more than one drugs. In this study, we recruited 24 subjects who only took Ketamine or primarily used it according to the research criteria. This special group of subjects can illustrate some essential features of illicit drug abuse in youth. A more in-depth analysis of each subject was conducted to complement the quantitative approach. Individual case history with special reference to the family background, character profile, drug abuse patterns, physical and psychosocial consequences, reasons for Ketamine initiation, preference and abstinence were described (Appendix 5).

13. Ecstasy abuse:

Ecstasy was rarely used as the sole drug for recreational use. Only 6 subjects with primarily Ecstasy abuse could be recruited in this study. In view of the small number of primarily Ecstasy users, it is very difficult to attribute any observed impairment to Ecstasy use from statistical comparison with control subjects. We attempted to solve this difficulty by performing a preliminary analysis combining the 6 primarily Ecstasy users and those who abused both Ecstasy and Ketamine as a group for the comparison with control subjects. ANOVA tests controlled for both education level and frequency of Ketamine use was performed. However, no significant result was observed.

VI: Interpretation of Results

We found that Ketamine is popular as a drug of abuse in youngsters in Hong Kong. It is commonly used with other illicit drugs especially Ecstasy. It is most preferred for recreational use as compared with other illicit drugs. Young people would like to use it with their friends in bar and disco. They usually began taking the drug at early age (i.e. 16-17 years of age) and frequently up to an average of 300-400 times within 3 to 4 years.

Our result is contradictory to the commonly held belief that Ketamine has low dependence potential or it is unlikely to cause physiological dependence. This study shows that there is high percentage (78.9%) of Ketamine abusers fulfilling the DSMIV criteria for dependence syndrome and majority (76.1%) of them also had the physiological dependence features (i.e. either tolerance or withdrawal). Fatigue, irritability, poor sleep and depression were commonly reported as withdrawal symptoms. The dependence features of Ketamine have been described from case reports (Lim 2003; Pal et al 2002). Our results further show that repeated Ketamine use for about 1 year would be vulnerable to develop dependent syndrome.

When compared to non-abusers, Ketamine users had more mental disturbances as reflected from their higher BPRS score assessing the psychotic, mood, and anxiety symptoms. Moreover, significant proportion (26%) of them had a psychiatric diagnosis apart from the substance use disorders. The two most common diagnoses were affective

disorders and drug induced psychosis. It is consistent with study conducted in USA (Grant et al 2004).

There are evidences showing impairment of some neurocognitive functions of the Ketamine users. They had more soft neurological signs especially the motor coordination type. The association of soft neurological signs and Ketamine abuse has not been adequately and specifically investigated. From our study, it is interesting to note that the neurological deficit was more severe in primarily Ketamine users than those who abuse Ketamine together with other illicit drugs. It is also true for the impairment of the executive function as reflected from the Six Element Test in which primarily Ketamine abusers had the poorest performance as compared to both control subjects and the polydrug abusers. Moreover, we observed a trend of impairment in verbal memory function in Ketamine abusers. Their inefficient semantic clustering memory strategy and abstract thinking might affect their memory. The trend of memory impairment is largely consistent with other studies looking into the acute effect from Ketamine in healthy volunteers (Morgan et al 2004) and drug abusers (Curran and Morgan 2000). Since the verbal memory impairment was at trend level without reaching the significance level set in this study, further research with large sample size and more detailed memory assessment are important for confirmation.

Sensation seeking by definition is “the need for varied, novel, and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experience” (Zuckerman and Neeb 1979). From our results, disinhibition

from the sensation seeking scale was found to be more marked in both primarily Ketamine and Polydrug group while higher experience seeking was found only in the polydrug group. It may indicate that disinhibition is a general vulnerability factor for drug abuse and likely other risk-taking behaviour. The choice of drug would be affected by other factors including other personality traits and expectancy of drug effects. It is evidenced from the higher experience seeking tendency in subjects with polydrug abuses. They would have more craving for new drug effects from various kinds of drugs. Moreover, our results from the SEQ demonstrate that the Ketamine abusers realized the negative effect of the illicit drugs, however both Ketamine groups had different expectation of desirable effects. The primarily Ketamine abusers expected relaxation and tension reduction while the Ketamine polydrug group expected positive effects e.g. happiness, sexual potency, excitement, increased work efficiency, increased self-esteem, higher power of control etc. This may indicate that the expectation of drug effect would govern a person to try different drugs or in different combination. Those who expect calming effect would consider Ketamine while those who expect excitation and various psychic stimulations would try various combinations of drugs to seek for the excitement. Nevertheless, drug expectancy and drug taking behaviour is a complicated cognitive social interaction apart from the specific pharmacological effects of an individual drug. A person would acquire the expectation of drug effect from social learning prior to drug use (Goldman et al 1991). This may influence drug initiation. Along with the drug taking social context, the drug expectancy can also influence the subjective effect one may experience (Sher 1985). This may perpetuate the use of certain preferred drugs in particular context.

According to the qualitative analysis of the primarily Ketamine abuser group in our study, four important features are noted from the risk factors of preferentially Ketamine abuse.

(i) Ketamine effect:

Ketamine generates fast drug effects on abusers that they can experience the desirable drug effects quickly after taking it. On one hand, most of the respondents opined that they valued Ketamine for its positive effects such as floating sensations, high and relax feelings, perceptions of increased activity level, and being more sociable and energetic. They treasured the immediate gratification from fast Ketamine effects. On the other hand, many respondents claimed that Ketamine can reduce their preexisting unhappy feelings, boredom, stress and tension. Ketamine can help them to escape from difficulties in daily life and be problem-free temporarily. Thus, the respondents ignored the adverse drug effects by what they considered to be desirable effects. Majority of respondents realized that other illicit drugs such as ice, ecstasy, and heroin would be too strong and can be harmful to their health. They thought that Ketamine just gave them a transient mild psychological distortion without leaving long-lasting damage. The present findings are consistent with foreign studies that Ketamine produced desirable drug effects to the abusers (Zacny and Galinkin 1999).

(ii) Cognitive distortion:

Some respondents displaced a self-deception on the deteriorations of their physical health. They denied any harmful effect on their physical and psychosocial well being though they presented an obvious decline in their health status. On detailed assessment, they commonly reported certain physical and psychological symptoms e.g. getting more headaches, shaking of hands, feelings of anxious and depressed, loss of interest in social activity, as well as decreased productivity at work. Many of the subjects agreed that taking Ketamine has jeopardized their work or study. Moreover, the respondents failed to aware of their dependence on Ketamine. Actually, by systematic evaluation, majority of the respondents revealed several of the DSMIV dependence features. They were unable to control their persistent desire in chasing Ketamine and even gave up all their other activities. Ketamine dominated the abusers' daily life that they spent most of their time in getting, using and thinking about Ketamine. They would use higher dosage and more frequently for the desirable effects over time. They had great difficulty to stop or just cut down the dosage and frequency of Ketamine use. Some subjects also experienced withdrawal symptoms once Ketamine intake was stopped or reduced. These observations are consistent with the previous findings that Ketamine abuse generated dependence and tolerance features among abusers (Doston et al 1995; Freese et al 2002).

(iii) Personality pattern:

Roughly many respondents presented an impulsive and sensation seeking personality pattern. Some subjects claimed that they could hardly control their impulse

and easily got bored. They exhibited a thrill seeking tendencies and enjoyed uninhibited parties. They believed that they could get more fun at parties with Ketamine. In addition, some respondents had an outgoing personality that they enjoyed seeking novelty. They adapted to a diversified environment easily as they are more liberal and socially tolerant. These Ketamine abusers valued the adventure seeking opportunities and accepted this illicit drug easily. The observations above are consistent with the view of (Conway et al 2002) that individuals with substance abuse or dependence scored higher than those without in behavioral disinhibition such as impulsivity and sensation seeking. Their constraints level is much lower than normal population who did not use drug. They are also consistent with previous research that substance abusers are more impulsive (Allen et al 1998; Moeller and Dougherty 2002; Patton et al 1995).

(iv) Environmental factors:

Peer played a significant role in youth Ketamine abuse. A significant proportion of respondents mentioned that they usually took Ketamine with their friends at restaurants or bars. Respondents with more good friends abusing Ketamine would also used Ketamine more often in the presence of such friends especially in pubs and discos. Almost all of the subjects were introduced Ketamine by their friends for the first time of use. They witnessed that their friends got fun and high feelings after using Ketamine and thus they would follow their Ketamine abusing behaviour. It is particularly encouraging to use such illicit drug in the context of rave party when everybody is preoccupied with the music and being disinhibited in their behaviour. Moreover, some subjects claimed that Ketamine is easily accessible that can reinforce their Ketamine use. Some young

ladies began to use Ketamine mainly because they needed to identify with their boyfriends who were Ketamine abusers.

Some abusers had frequent consumption of Ketamine in the past, but they had already stopped taking it for several months prior to the interview. The reasons for their abstinence were derived from the in-depth investigation of the 24 primarily Ketamine abusers. Six major reasons were observed.

(i) Intrinsic motivation:

According to the present study, some respondents are open-minded and subjected to advice. When they are informed about the potential bad consequences of abusing Ketamine, they would consider seriously about cutting down the use even though there is no obvious harmful effects noted on them. However, the proportion of this kind of abusers is small.

(ii) Change in social circle:

As mentioned previously, the initiation and continuation of Ketamine use are largely influenced by peers. They opined that identification with peers is important. Thus they would take illicit drugs despite the potential dangerous consequences. Some subjects mentioned that they stopped taking Ketamine immediately after they had changed their social circle e.g. when they moved house, changed school or job. Once they did not go out with their friends who abused drugs, they can abstain from Ketamine use more readily unless they developed dependence on it.

(iii) Physical harm:

Although many of the subjects know about the possible harmful effects from Ketamine, they think that these are too distant from them. They believe that they have strong body and good health that Ketamine cause no harm to them. Moreover, they would not consider the harmful effects seriously when they were having fun and excitement together with their friends in disco. Thus they would continue to abuse Ketamine only until there were obvious physical symptoms. Actually, a significant proportion of the subjects reported a decline in their physical condition after abusing Ketamine when they were examined systematically. They reported suffering from various kinds of physical illness by their frequent consumption of Ketamine. After experiencing these physical discomforts, the respondents started to realize that Ketamine is really harmful to them. Thus they began to cut down or totally stop it.

(iv) Legal constraints:

With regard to the present findings, some of the Ketamine abusers stopped using the drug mainly because of legal constraints. Some subjects reported having criminal records for crimes that were related to drugs. They were sentenced to drug detoxification center or on probation to provide community services. In this situation, their real motivation to abstain drug was doubtful. Actually from their verbal account, some of them continued to abuse Ketamine even during the probation period. They stopped using the drug only several days before seeing their probation officers. Some of them reinstated Ketamine abuse shortly after leaving the detoxification center or completion of the probation period.

(v) Financial problem:

Many respondents came from a lower social class that they spent a large proportion of their income on Ketamine. They could not afford it anymore after a period of regular use. They would then reduce the frequency and amount of use. Similarly when they were out of job and their friends could not support their Ketamine use, it was the time they would stop using it unless they were dependent on it. On the other hand, some would continue to take it because of their craving for the drug. They would go for other sources with cheaper cost. Frequently, they obtained less pure Ketamine with various unknown adulterants in it. The potential harmful effects would be much higher.

(vi) Accessibility:

By the effort of our enforcement bodies on the legislation and law enforcement measures against illicit drug use and trafficking, it would be very difficult for the abusers to obtain Ketamine. At that time, they would reduce the amount and frequency of use. When there was shortage of supply or the price was sky-high, they would then stop it. However, many of them resumed the usage once the supply was available again.

In summary the current findings from this study confirm our first four hypotheses as described in Section 3 on p14. (1) Ketamine was found to be addictive in nature with both physiological and biological symptoms of dependence. (2) High sensation seeking (experience seeking and disinhibition) and positive expectancy of drug effect (global positive effect and relaxation / tension reduction) were found to be associated with Ketamine use. (3) Ketamine users were found to have more soft neurological signs and impairment in executive function. Our findings may also suggest an impairment of memory by using less semantic clustering and abstract thinking as memory strategy, although further large scale studies with detailed memory assessment are required for unequivocal confirmation. (4) Ketamine users were found to have impairment in the physical, mental and social well being as evidenced by the frequent acute intoxication, higher BPRS scores, significant proportion of mental disorders and higher proportion of criminal record and unemployment among the abusers. Concerning hypothesis (5), it is interesting to observe that primarily Ketamine users had more impairment in soft neurological signs and executive function than Ketamine polydrug users.

VII: Recommendations

Ketamine is still currently popular drugs for recreational use in Hong Kong, but most of the young people are not fully aware of the bad consequences. Thus, it is particularly important to identify specific harmful effects from the drugs in our Chinese context in Hong Kong. We would like to make the following recommendations based on our current findings.

1. Education and Prevention:

Most of the young people frequently hold a wrong belief that Ketamine would just temporarily alter their feeling without long-lasting negative consequence. They also believe that it is not addictive in nature and they can control their use freely. However, our results indicate that prolonged use of Ketamine can develop dependence syndrome with physiological symptoms. It can be harmful to the cognitive function and psychological well being. Thus strategic education and prevention programs should be launched with emphasis on the addictive nature and negative consequences. It is particularly important for those high risk groups e.g. those with high sensation seeking and high expectation from the illicit drug effect. Apart from educating the harmful effects of Ketamine, other psychosocial measures are also important for drug abuse. These include helping the youth to develop healthy social support network, psychosocial competence to refuse drugs and substitution by other alternative activities.

2. Medical and Psychosocial intervention:

With the rapid increase in Ketamine, Ecstasy and other new types of drug abuse, more young people would be affected by drug dependence, physical and mental morbidity and cognitive impairment in the community. This implies increasing need of service provision from the health care and social security system. General practitioners in the community should be alert to the potential drug abuse related health hazards. Appropriate screening, management and referral to drug treatment centers are important.

3. Judicial reference:

Currently, there are diverse views on the relative addictive potential and harmful effect of Ketamine in litigation due to a lack of local research data. The results from our study can provide references for the dangerous level in terms of addictiveness and harmful effects of Ketamine.

4. Research studies:

Similar research studies can be conducted for other illicit drugs in order to understand their specific health hazards in the real drug abuse context in Hong Kong. These local data has its distinctive ethnic and socio-cultural values as compared to studies from other countries.

VIII: Limitations of the Study

1. Sample size:

It was difficult to recruit large number of subjects with history of drug abuse to join our research program requiring them to attend our research center and spend several hours for detailed assessment. Thus we could only recruit a modest number of subjects within the time frame of the study. Some of the negative findings from this study might be due to inadequate statistical power. However, most of the outcome measure with negative findings had very small effect size (i.e. $f < 0.1$) when the 2 Ketamine groups were compared with the control group. Given this small effect size, it requires a total of 969 subjects for statistical analysis with power=0.8 and $P < 0.05$. Even though there is such large sample size recruited and the between groups difference reaches statistical significance, it is clinically doubtful about the significance of such small difference between Ketamine abusers and control subjects in real life. Thus, the current sample collected is able to reflect the truth of the real life phenomenon.

2. Subject recruitment:

The drug abuse subjects were mainly identified and referred by social workers from the dance scene and drug centers. However, most of the control subjects were not recruited from the dance scene. It was because very few young people frequently danced in disco had no history of illicit drug use. Thus both of the drug abusers and control

subjects might come from different social background which may bias the results towards more adverse outcome in the drug abuse group. We attempted to reduce such bias by controlling the psychosocial factors especially education level which is important for measuring neurocognitive function.

Moreover, those drug abusers who were willing to attend for a detailed assessment might already have high frequency of drug use and experienced health hazard. Thus it might further bias the results towards poorer outcome in the abuser group. Thus the interpretation of our result should be restricted to a group of heavy illicit drug users. It may not be applicable to those occasional users.

3. Blindness of the Study:

The investigator who assesses the neurocognitive function of the subjects was blinded to the group membership of the subjects as far as possible. However, some of the subjects were obvious for their drug abuse status from their appearance and conversation. However, the battery of neurocognitive assessment was standardized for instruction, administrative procedure and scoring in order to avoid individual bias.

4. Ecstasy abuse:

Concerning the Ecstasy abuse, the genuine phenomenon in Hong Kong and other countries is that Ecstasy is very rarely as a sole drug of abuse (Degenhardt et al 2004).

Without an adequate number of primarily Ecstasy abusers, it is almost impossible to obtain robust result regarding to its direct harmful effect to young people. We have tried to conduct a preliminary analysis of the Ecstasy data by grouping all the subjects who abused ecstasy alone and those also abused Ketamine. Then we compared this combined group of Ecstasy abusers with the control subjects by using ANCOVA controlling for education level and also in particularly the Ketamine using frequency. This type of analysis can help to a certain extent to partial out the effect from Ketamine use. However, the results are largely insignificant. Since there is likely to have drug-drug interaction and various combination effects from polydrug intake, it is unwise to put too much emphasis on the findings from this polydrug group data analysis. Thus, the negative findings of Ecstasy from the polydrug group cannot exclude the presence of genuine harmful effect from ecstasy.

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Appendix 1

普通健康問卷(1983)

請仔細閱讀以下的說明：

我們想了解你有沒有醫療方面的問題，以及你在最近幾個星期的健康情形。請在以下每一項問題的四種答案中選出你認為最能表達你的健康情況的答案，以 (u) 表示出來。請記住我們想知道的是你目前和最近的健康情形。以下的問題對我們都很重要，請你答覆每個問題。

謝謝你的合作。

請問你最近是不是：

1. 覺得健康很好？	比平時 好一些	和平時 一樣	比平時 差一些	比平時 差很多
2. 覺得需要進補品或服補藥？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
3. 覺得相當疲倦？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
4. 覺得身體不適？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
5. 覺得頭痛？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
6. 覺得頭部有壓迫感？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
7. 做事能集中注意力 (集中精神)？	比平時 好一些	和平時 一樣	比平時 差一些	比平時 差很多
8. 害怕會在公眾場所體弱不支？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
9. 覺得發熱或發冷？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
10. 覺得自己冒冷汗？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
11. 很早醒來而難以再入睡？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
12. 睡後醒來但覺精神未復原？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
13. 覺得太倦及不想進食？	一點也不	和平時 差不多	比平時 多一些	比平時 多很多

14. 為擔憂而失眠?	一點也不	和平時差不多	比平時多一些	比平時多很多
15. 覺得頭腦清醒?	比平時好一些	和平時一樣	比平時差一些	比平時差很多
16. 覺得精神力充沛?	比平時好一些	和平時一樣	比平時差一些	比平時差很多
17. 很困難才能入睡?	一點也不	和平時差不多	比平時多一些	比平時多很多
18. 很難熟睡?	一點也不	和平時差不多	比平時多一些	比平時多很多
19. 有可怕或不愉快的夢境?	一點也不	和平時差不多	比平時多一些	比平時多很多
20. 覺得晚上坐臥不安, 很困擾?	一點也不	和平時差不多	比平時多一些	比平時多很多
21. 忙著工作而不會感到閒著無聊?	比平時多一些	和平時一樣	比平時少一些	比平時少很多
22. 工作效率比以前慢些?	比平時快一些	和平時一樣	比平時慢一些	比平時慢很多
23. 對日常活動失卻興趣?	一點也不	和平時差不多	比平時多一些	比平時多很多
24. 無心注重外表?	一點也不	和平時差不多	比平時較無心	比平時更無心
25. 較少注重服裝?	比平時多些	和平時一樣	比平時少些	比平時少很多
26. 到街上(屋外)的次數和平常一樣?	比平時多一些	和平時一樣	比平時少一些	比平時少很多
27. 覺得自己處事不錯, 其他人也不過如此?	比別人好一些	和別人一樣	比別人差一些	比別人差很多
28. 覺得一般事情自己應付得很好?	比平時好一些	和平時差不多	比平時差一些	比平時好很多
29. 遲遲才上班工作或做家務?	一點也不	和平時差不多	比平時遲一些	比平時遲很多
30. 對自己做事的方式感到滿意?	比平時較滿意	和平時差不多	比平時較不滿意	比平時更不滿意
31. 覺得能溫暖親切地對待接近你的人?	比平時好一些	和平時差不多	比平時差一些	比平時差很多
32. 覺得自己很容易和人相處?	比平時好一些	和平時差不多	比平時差一些	比平時差很多
33. 跟人交談的時間和以前一樣多?	比平時多一些	和平時差不多	比平時少一些	比平時

				少很多
34. 因怕說錯而害怕和別人談話?	一點也不	和平時差不多	比平時多一些	比平時多很多
35. 覺自己在各方面擔當有用的角色?	比平時有用	和平時差不多	比平時沒用	比平時更沒用
36. 覺得處事可以拿定主意?	比平時多一些	和平時差不多	比平時少一些	比平時更少
37. 覺得任何事都難以開始?	一點也不	和平時差不多	比平時多一些	比平時多很多
38. 對每樣你需要做的事覺得害怕?	一點也不	和平時差不多	比平時多一些	比平時多很多
39. 覺得總是有精神上的壓力?	一點也不	和平時差不多	比平時多一些	比平時多很多
40. 覺得無法克服困難?	一點也不	和平時差不多	比平時多一些	比平時多很多
41. 覺得生活是不停的鬥爭?	一點也不	和平時差不多	比平時多一些	比平時多很多
42. 覺得日常生活有趣味?	比平時多一些	和平時差不多	比平時少一些	比平時少很多
43. 做事過份認真?	一點也不	和平時差不多	比平時多一些	比平時多很多
44. 覺得自己很易發怒?	一點也不	和平時差不多	比平時多一些	比平時多很多
45. 會無緣無故地害怕或驚慌?	一點也不	和平時差不多	比平時多一些	比平時多很多
46. 能夠勇敢面對問題?	比平時多一些	和平時差不多	比平時少一些	比平時少很多
47. 覺得每樣事情都難以應付?	一點也不	和平時差不多	比平時多一些	比平時多很多
48. 覺得別人在注意著你?	一點也不	和平時差不多	比平時多一些	比平時多很多
49. 覺得心情不快樂及憂鬱?	一點也不	和平時差不多	比平時多一些	比平時多很多
50. 對自己失去信心?	一點也不	和平時差不多	比平時多一些	比平時多很多
51. 覺得自己沒用?	一點也不	和平時差不多	比平時多一些	比平時多很多
52. 覺得生活毫無希望?	一點也不	和平時差不多	比平時多一些	比平時多很多

53. 覺得將來充滿希望?	比平時 多一些	和平時 差不多	比平時 少一些	比平時 少很多
54. 大致上感到快樂?	比平時 多一些	和平時 差不多	比平時 少一些	比平時 少很多
55. 覺得常常精神緊張?	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
56. 覺得不值得繼續生活下去?	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
57. 想到結束自己生命的可能?	絕不會	我想不會	曾經想過	認真想過
58. 覺得有時精神太差而不能做任何事?	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
59. 希望及早死去，提早解脫?	一點也不	和平時 差不多	比平時 多一些	比平時 多很多
60. 覺得自殺的念頭常出現在腦裏?	絕不會	我想不會	曾經想過	認真想過

Appendix 2

Barratt Impulsiveness Scale

姓名： _____ 教育程度： _____

出生日期（日／月／年）： _____ 性別： 男／女

職業： _____ 常用手： 左／右
／左右並用

指引： 人們在不同情況下會有不同的想法和行爲。這份問卷是用來測量你的思考及行爲模式。
請細心閱讀以下句子，在句子右面圈出適當的答案。請儘快依實作答。

		從不/甚少	偶爾	經常	總是
1	我會小心計劃工作	1	2	3	4
2	我做事不經思考	1	2	3	4
3	我能很快作出決定	1	2	3	4
4	我樂天知命 (樂天, 無憂無慮)	1	2	3	4
5	我做事"無心裝載"	1	2	3	4
6	我的思想快得難以控制	1	2	3	4
7	我在出發前計劃行程	1	2	3	4
8	我能自我控制	1	2	3	4
9	我很容易集中精神	1	2	3	4
10	我會定期儲蓄	1	2	3	4
11	我在嬉戲或上課時感到"坐立不安"	1	2	3	4
12	我是一個思想謹慎細密的人	1	2	3	4
13	我會計劃以確保自己有一份穩定的工作	1	2	3	4

14	我說話前不經思考	1	2	3	4
15	我喜歡思考複雜的問題	1	2	3	4
16	我轉換工作 *(若身份為學生可選不適用)*	1	2	3	4
17	我行事衝動	1	2	3	4
18	我在處理思考性問題時容易發悶	1	2	3	4
19	我會興之所致而行事	1	2	3	4
20	我是一個思想穩重的人	1	2	3	4
21	我轉換居住的地方	1	2	3	4
22	我隨心所欲地購物	1	2	3	4
23	同一時間內,我只能思考一個問題	1	2	3	4
24	我轉換嗜好	1	2	3	4
25	我花費或支付的金錢比收入多	1	2	3	4
26	我在思考時有很多雜念	1	2	3	4
27	相對於將來,我對現在的事情更感興趣	1	2	3	4
28	我在上課或聽演講時感到不耐煩	1	2	3	4
29	我喜歡動腦筋的遊戲 (如砌圖, 串字, 謎語)	1	2	3	4
30	我計劃將來	1	2	3	4

Appendix 3

Sensation Seeking Scale

SSS-V (興趣與特殊喜好測驗)

說明：請你從下面每道題後的 A、B 兩種選擇答案裏，選擇一個對你最合適的、最能夠描述你的喜好或感受的答案，並將題號填入每題前的方格內。如果你發現這兩道題的內容對你都合適，就選出其中你認為最恰當的那個；如果你發現這兩道題目對你都不合適，就選出你比較喜歡的那一個。

請注意，你一定要在每道題的 A、B 中選擇其一。本測驗只了解你的喜好和興趣，不關心別的內容。而且每道題的答案沒有正確或錯誤之分，請你一定實事求是地對自己做出準確而恰當的評價。

- 1. A 我喜歡氣氛“狂野”、不受任何限制的聚會。
B 我更喜愛氣氛安靜、能夠進行良好交談的聚會。
- 2. A 某些電影，我願意看第二遍甚至第三遍。
B 如果看一部以前曾經看過的影片，我會很不耐煩的。
- 3. A 我常希望能夠當一名登山運動員。
B 我無法理解人們為什麼要冒著生命危險去爬山。
- 4. A 我不喜歡任何的身體氣味。
B 我喜歡聞某些泥土似的身體氣味。
- 5. A 每天都見到同樣的面孔會使我厭煩。
B 我喜歡和令人愉快的、關係密切的普通朋友們在一起。
- 6. A 即使可能會迷路，我也喜歡獨自去探查某個陌生的城市或地區。
B 來到某個陌生的地方，我很希望能有一個向導。
- 7. A 我討厭有人說或做出一些令別人感到震驚或不安的事。
B 如果你能預知某人將要說或做的幾乎任何事，你一定覺得此人令人厭煩。
- 8. A 我通常不喜歡那些能預先猜到後面情節的電影或遊戲。
B 電影或遊戲是否使人預知後面的情節，我並不在乎。

9. A 我曾經試過吃搖頭丸或很想去嘗試。
B 我從來不願意吃搖頭丸。
10. A 我不喜歡嘗試吃任何能產生奇異和危險作用的藥品。
B 我很想嘗試服用一些能產生虛幻感覺的新藥。
11. A 一個聰明人應該避免做有危險性的事情。
B 我有時喜歡做一些有點嚇人的事。
12. A 我不喜歡“放蕩不□的人”。
B 我喜歡和“放蕩不□的人”交朋友。
13. A 我發現刺激性的東西會使我感到很不舒服。
B 我常常喜歡處於高度的興奮狀態（如喝烈性酒、吃搖頭丸等）。
14. A 我想嘗試一些以前沒吃過的新食物。
B 爲了避免引起失望和不快，在飯館吃飯時我會點那些熟悉的菜。
15. A 我喜歡看家庭生活或出外旅游的照片。
B 觀賞別人的家庭生活或旅游照片會令我非常厭煩。
16. A 我很想去嘗試一下“笨豬跳”。
B 我不願意嘗試“笨豬跳”。
17. A 我很想嘗試一下高山滑雪。
B 我不願意嘗試高山滑雪。
18. A 我寧願在出外旅行前沒有任何預先的計劃、固定的程序或時間表。
B 旅行前，我喜歡詳細制定出我的旅行路綫和時間表。
19. A 我更喜歡選擇“腳踏實地”的人做朋友。
B 我願意和一些比較“前衛”或不尋常的人交朋友。
20. A 我不願意去學開飛機。
B 我很想開著飛機在天空翱翔。
21. A 游泳時，我寧願在水面上游，不喜歡潛泳。
B 我喜歡帶著呼吸器在深水裏潛泳。
22. A 我很想認識一些有同性戀傾向的人。
B 如果我懷疑某人可能是同性戀，就會盡量離他遠點兒。
23. A 我很想去嘗試跳傘。
B 不管多麼有趣，我也不願意從飛機上跳傘下來。

- 24 · A 我偏愛那些令人興奮、能給人以出乎意料感覺的朋友。
B 我偏愛那些可靠、彼此了解的朋友。
- 25 · A 我對體驗本身不感興趣。
B 我喜歡新的、令人興奮的體驗和感覺，即使會有點嚇人、不合傳統或非法。
- 26 · A 好的繪畫作品應該有清晰、對稱的形狀、協調的顏色。
B 我發現現代派繪畫中不和諧的顏色和不規則的形狀很美。
- 27 · A 我喜歡在熟悉的家庭環境中消磨時光。
B 如果必須較長時間呆在家裏，我會感到煩躁不安。
- 28 · A 我喜歡從較高的跳台上跳水。
B 我不喜歡站在很高的跳台上時的那種感覺（或者不願靠近）。
- 29 · A 我很想和那些有魅力的異性約會。
B 我喜歡同那些與我有相同價值觀的異性約會。
- 30 · A 由於有人喝酒過量而大聲喧嘩、吵吵嚷嚷，通常會損壞聚會的氣氛。
B 使大家開懷暢飲、盡興而歸是一次良好聚會的關鍵。
- 31 · A 與人交往時，最惡劣的失禮行為是待人粗魯。
B 社交時最應注意的就是不要使人感到乏味。
- 32 · A 一個人在結婚之前應該有足夠的性經驗。
B 夫妻之間最好在結婚以後才開始獲得性經驗。
- 33 · A 即使有錢我也不願意參加一個旅行團到外地旅游。
B 出外旅游時，我寧願參加一個安全可靠的旅行團。
- 34 · A 我喜歡那些犀利、敏捷的人，儘管他們有時會冒犯別人。
B 我不喜歡那些以損害別人感情的方式開玩笑的人。
- 35 · A 總的來說，現在電影或電視中描寫性的鏡頭過多了。
B 我喜歡看電影或電視裏涉及到性的場面或“色情電影”。
- 36 · A 我喝了幾杯酒以後感覺最好。
B 那些需要喝酒才感到滿足的人有些不正常。
- 37 · A 人們應該根據是否得體、整潔和流行的標準選擇自己的穿著。
B 即使有時會使人感到奇特，人們還是應該按照自己的方式穿衣服。

- 38 · A 在海裏或泳池裏游泳時，我願在靠近岸或池邊的地方游。
B 游泳時，我喜歡游到離岸很遠的地方去。
- 39 · A 我對那些反應緩慢、令人乏味的人缺乏耐心。
B 我跟交談的任何人都幾乎都能找到一些有趣的話題。
- 40 · A 滑雪時，僅靠滑雪杖從很高的山坡上快速滑下來，實在太危險了。
B 我很想親自體驗一下，從很高的山坡上飛速下滑時的那種奇特感覺。

Appendix 4

Stimulant expectancy questionnaire

有關對興奮劑期望的問卷

下列的句子是有關服用興奮劑可能帶來的效果，興奮劑包括可卡因，安非他明（crystal meth, speed）請你仔細閱讀每句句子，然後按你個人對興奮劑的想法、感覺和認識去回答便可。你無需考慮其他人的意見，只要根據自己意見作答便可。我們希望得到的是你的意見，所以無論你自己是否曾經服用過興奮劑，你只需要依照你所知道的及你的意見去回答。

每一題都沒有正確或錯誤的答案，重要的是你回答每題。

就以下兩種興奮劑，哪種是你曾經服用過或有較多的認識？(請圈出其中一項)

A. 可卡因

B. 安非他明

請你根據你較為認識的興奮劑去回答下列各題。請你誠實作答 — 記住，你的答案是完全保密的。你只需按你個人對服用「中度」分量的興奮劑所知道或認同的去回答便可。而何為「中度」則由你個人判斷。

1 = 非常反對

2 = 有點反對

3 = 不肯定

4 = 有點同意

5 = 非常同意

	非常 反對				非常 同意
1. 興奮劑減少我肚餓的感覺。	1	2	3	4	5
2. 興奮劑增加我的性慾。	1	2	3	4	5
3. 食興奮劑後，我會講一些自己唔唸住講或無意講的說話。	1	2	3	4	5
4. 我覺得服用興奮劑和飲酒帶來的效果不同。	1	2	3	4	5
5. 興奮劑令我講□更加有趣。	1	2	3	4	5
6. 食興奮劑後，我會焦慮和緊張。	1	2	3	4	5
7. 興奮劑令我成個人都加快起來。	1	2	3	4	5
8. 興奮劑令我像在夢中及甚麼都不在乎。	1	2	3	4	5
9. 興奮劑令我變得貪婪。	1	2	3	4	5
10. 興奮劑令我顫抖。	1	2	3	4	5
11. 興奮劑令我產生妄想。	1	2	3	4	5
12. 食興奮劑後，我覺得成個世界都無問題。	1	2	3	4	5
13. 食興奮劑後，我沒有變得不耐煩或激動。	1	2	3	4	5
14. 食興奮劑後，我感到極之快樂。	1	2	3	4	5
15. 對比唔食的時候，食興奮劑令我感覺更好。	1	2	3	4	5
16. 興奮劑不能令我更有活力。	1	2	3	4	5
17. 興奮劑令我過度活躍，（如：講太多□）	1	2	3	4	5
18. 食興奮劑後，我唔會變得特別興奮。	1	2	3	4	5
19. 興奮劑令我的胃不太舒服。	1	2	3	4	5
20. 興奮劑給我一種突被沖走及好“high”的感覺。	1	2	3	4	5
21. 興奮劑增加我的活動量。	1	2	3	4	5
22. 食興奮劑後，我會磨牙。	1	2	3	4	5
23. 興奮劑令我心跳加速，全身的血液運行得好快。	1	2	3	4	5
24. 興奮劑令我麻木。	1	2	3	4	5
25. 食興奮劑會導致心臟問題。	1	2	3	4	5

26. 食興奮劑後，我會去多□廁所。	1	2	3	4	5
27. 食興奮劑後，我會更加精神和醒覺。	1	2	3	4	5
28. 食興奮劑後，我有刺熱及被針“吉”的感覺。	1	2	3	4	5
29. 食興奮劑後，我做事能力提高了。	1	2	3	4	5
30. 興奮劑令我覺得自己更加重要。	1	2	3	4	5
31. 食興奮劑後，我唔會容易發脾氣。	1	2	3	4	5
32. 興奮劑令我覺得自己可操縱周圍的事。	1	2	3	4	5
33. 食興奮劑不會令我頭暈。	1	2	3	4	5
34. 食興奮劑減低我對別人的敏感程度。	1	2	3	4	5
35. 食興奮劑令我覺得自己可以做得任何□。	1	2	3	4	5
36. 食興奮劑後，我難集中做一件事情。	1	2	3	4	5
37. 興奮劑令事情變得模糊。	1	2	3	4	5
38. 興奮劑不會使我流汗。	1	2	3	4	5
39. 食興奮劑後，我不能深入思考。	1	2	3	4	5
40. 興奮劑令我更懂得同人交際。	1	2	3	4	5
41. 興奮劑令我口乾和口渴。	1	2	3	4	5
42. 興奮劑令我感覺不好。	1	2	3	4	5
43. 興奮劑給我“high”的感覺過去之後，我情緒會變得低落及沒精打采。	1	2	3	4	5
44. 興奮劑降低我的性表現。	1	2	3	4	5
45. 食興奮劑後，我容易失控。	1	2	3	4	5
46. 食興奮劑令我重複又重複做同一件事。	1	2	3	4	5
47. 食興奮劑後，我常不覺得滿足，經常都想要更多。	1	2	3	4	5
48. 食興奮劑後，我對現實的減少了注意。	1	2	3	4	5
49. 興奮劑對我的影響好少。	1	2	3	4	5
50. 興奮劑給我一種有能力控制的感覺。	1	2	3	4	5
51. 興奮劑導致幻覺。	1	2	3	4	5
52. 興奮劑不會改變我的性格。	1	2	3	4	5
53. 興奮劑令我對自己做緊的事失去興趣。	1	2	3	4	5

54. 興奮劑減低我的判斷能力。	1	2	3	4	5
55. 食興奮劑後，第二日我唔會反應遲鈍。	1	2	3	4	5
56. 食興奮劑後，我飲多□酒都唔會醉。	1	2	3	4	5
57. 食興奮劑後，我變得好多□講。	1	2	3	4	5
58. 食興奮劑令我覺得自己好似飲□好多咖啡。	1	2	3	4	5
59. 食興奮劑後我會感到害怕及恐慌。	1	2	3	4	5
60. 食興奮劑令我覺得好開心。	1	2	3	4	5
61. 興奮劑令我有攻擊性和控制慾。	1	2	3	4	5
62. 興奮劑令我思想更清晰。	1	2	3	4	5
63. 興奮劑使派對更好玩。	1	2	3	4	5
64. 興奮劑擴張我的瞳孔。	1	2	3	4	5
65. 興奮劑減少我肚餓的感覺。	1	2	3	4	5
66. 興奮劑令我顫抖。	1	2	3	4	5
67. 興奮劑給我一種突被沖走及好“high”的感覺。	1	2	3	4	5
68. 興奮劑令我覺得自己更加重要。	1	2	3	4	5
69. 興奮劑令我更懂得同人交際。	1	2	3	4	5
70. 興奮劑給我一種有能力控制的感覺。	1	2	3	4	5
71. 食興奮劑令我覺得好開心。	1	2	3	4	5

Appendix 5

Case Reports on Subjects Primarily Abused Ketamine

Case 01

Mr. A, is single aged 20 with a higher secondary school educational level. He is a skilled manual worker who works in a salon without any religious background. Mr. A comes from a nuclear family with two brothers. Their family income is between \$5,000 and \$10,000 per month. His parents are now being unemployed and his father suffers from alcoholism. Concerning the personality of Mr. A, he is not considered as a particular impulsive person. He describes himself as a cautious person who usually plans well before taking action. However, it is difficult for him to concentrate on particular job or person. He sometimes gets bored at lessons easily.

Mr. A started smoking at 10-year-old and became a regular daily smoker at 14. Occasionally, he would drink alcohol with his friends. At 16-year-old, he started experiencing illicit drugs. One year later, he began to abuse Ketamine on a weekly basis. He was fond of Ketamine mainly because he expected to get a high feeling from it. He has taken Ketamine for about 200 times. He usually took it at restaurants or bars with his friends. He believed that he would get more fun under Ketamine effect. He claimed that he had more pleasant feeling when compared with the time before using Ketamine. Moreover, he denied any acute intoxication for Ketamine abuse.

Regarding the physical well being of Mr. A, his health condition deteriorated sharply after abusing Ketamine. He reported more headaches, sleep disturbance, being

stressful, and lack of energy. His productivity level decreased with loss of interest in daily activities. Moreover Mr. A reported features of dependence on Ketamine but without any withdrawal symptom. He possessed a persistence desire on Ketamine. He could hardly control his desire that he would give up other activities just for taking Ketamine. Once he took Ketamine, he usually took the dosage larger than he intended. Also, he gradually increased the dosage over the years in order to get the same drug effect. There were undesirable effects being imposed on his psychosocial condition. After abusing Ketamine, Mr. A opined that drugs harmed his interpersonal relationship. He has stopped his recreational activities. In addition, he was fired from his job as he used drugs during office hours. He was also sentenced to detention center for crimes that were not directly related to drug.

In conclusion, Mr. A is primarily Ketamine user for about 4 years with dependence features. Three months prior to the interview, he has stopped using Ketamine because of the harmful effects developed.

Case 02

Mr. B, is single aged 21 with a higher secondary school educational level. He is a skilled non-manual worker who works at a Photoshop. He is a Christian who comes from a nuclear family with one brother. Their monthly family income is between \$15,000 and \$20,000. His parents are skilled worker without any prior mental illness. He has been sentenced to detention center and required to provide social services for a crime not directly related to illicit drug. Regarding Mr. B's personality, he is considered as a mildly sensation seeker, but not a particular impulsive person. He likes to dive off the high board. He dares to take risks and enjoys adventure seeking activities. Moreover, he is an extrovert who prefers trying new things. At times he would act on impulse as well as comes up with new ideas.

Mr. B started smoking and drinking at 17 and become a regular daily smoker half year after he first smoked. At 18-year-old, he started abusing Ketamine and became a regular user one year afterward. Other than taking Ketamine, he also took Ecstasy and Marijuana occasionally without persistent use. Nonetheless, Mr. B placed Ketamine as his first priority among other illicit drugs. He used to take Ketamine at restaurants or bars with his girlfriend. He had taken Ketamine for nearly 300 times before he stopped using it three months prior to the interview. He stopped abusing Ketamine mainly because he realized the potential negative effects from it. He worried that his concentration level, cognitive thinking and sex performance would be impaired from taking Ketamine. Ketamine might also cause him to have hallucinations and depressive mood.

Concerning Mr. B's health status, he denied any obvious harmful effects on his physical health. However, he admitted that his psychosocial well being has deteriorated after taking Ketamine. His interpersonal relationship got worse. He had no interest in going out for social activity with friends. Sometimes he harboured suicidal thoughts especially when he felt unhappy. Mr. B reported dependence features on Ketamine. He had persistent desire to take Ketamine and spent most of his time thinking about and using Ketamine. He realized that Ketamine would cause harm to his health, but he had difficulty to reduce or stop taking it at the peak of his consumption. He developed tolerance to Ketamine and had withdrawal symptoms such as fatigue, excessive yawning and insomnia.

In conclusion, Mr. B is a heavy Ketamine user with dependence for 3 years. He is a sensation seeker, but not a particular impulsive person. He is an extrovert who likes to seek novelty. There are obvious harmful effects shown in his psychosocial status due to his frequent use of Ketamine. He can recognize the harmful effects and has stopped taking Ketamine.

Case 03

Miss. C is a single 15-year-old form three student without any religious background. She comes from a divorced family with a sister. Her father is a driver and her mother is a housewife. Their monthly family income is between \$5,000 and \$10,000. Concerning Miss. C's personality, she is an impulsive sensation seeker. She dares to experience adventure seeking activities such as flying an airplane and wild parties. She spends more than she earns without any constant saving. She does not usually think carefully and dislike planning ahead. She would not plan carefully in order to seek for a stable job. She also likes excitement e.g. she enjoys watching "sexy" scenes in the movies.

At 12-year-old, Miss. C started smoking. She became a regular smoker and began to drink at 13. She began to use Ketamine at 14 years old on weekly basis. She had taken Ketamine for approximately 100 times prior to the interview. She also took Ecstasy and Marijuana at times without regular usage. However, she opined that she would only preoccupied with Ketamine and took more than she planned. She usually took Ketamine at disco with her friends. She preferred Ketamine mainly because she expected the drug to reduce her tension and let her feel better. She would expect to be more energetic and get a high feeling from taking Ketamine. However, she denied any experience of acute intoxication from Ketamine.

Miss. C's physical condition has deteriorated since her Ketamine abuse. She got headache and felt difficult to recover her energy. She could hardly make decision as well

as losing interest in daily activities. Her interpersonal relationship and school performance were affected. She did not go out with friends because she went to use Ketamine. She was also being late for school sometimes because of the hangover effect from Ketamine at previous night. She showed dependence features on Ketamine. She had persistent desire to use Ketamine and had unsuccessful control on the use. If she stopped using Ketamine, she felt anxious and irritable. She reported running nose, rapid breathing and heart racing. She also experienced shaking of hands, tongue and eyelids during the withdrawal period. Despite harmful effects being made, she continued to use Ketamine and gave up other activities. Additionally, she developed adjustment disorder with depressed mood and marked functional impairment because of psychosocial stress which she refused to elaborate. She had been arrested for drug related crime and sentenced to probation services.

In conclusion, Miss. C is a heavy Ketamine user for one year with physiological dependence features. She primarily used Ketamine because of peer influence. She is an impulsive sensation seeker who likes to seek novelty. Obvious harmful effects on her physical and psychosocial well being are noted.

Case 04

Miss D, is a single 20-year-old lady with a higher secondary school educational standard. She is a Youth Ambassador without any religious background. Miss. D is the only daughter from a divorced family. Her stepfather is an unskilled worker who suffers from alcoholism and her mother is a secretary. Their monthly family income is between \$10,000 and \$15,000. Regarding the personality of Miss D, she is a sensation seeker but not a particular impulsive person. She enjoys uninhibited parties and dislikes rules and regulations. She would like to try some high risk sports activities like bungee jump as she prefers to stay at an extremely excited mood. However, she is not a happy-go-lucky person and would think carefully before she gives her opinion. Although she is a mean person who always being nitpicking, she possesses divergent thinking pattern that she can think from different points of view.

Miss D started smoking at 10-year-old and became a regular daily smoker several months later. Other than taking cigarette, she began to drink at 15 on social occasions. At 18-year-old, she started to experience illicit drugs and began to use Ketamine. She reported having Ketamine intake for about 40 times so far. She usually took Ketamine at restaurants or bars with her friends. She preferred to use Ketamine mainly because she expected to get a high feeling from the drug. She also believed that taking Ketamine can reduce her stress as well as became more energetic and sociable. She did not report any acute intoxication from taking Ketamine.

Concerning the physical health of Miss D, she reported obvious harmful effects from taking Ketamine. Her physical well being is worsening when compared with the time before abusing Ketamine. She had frequent headaches and was lack of energy most of the time. She had reduced interest in social activity and spent less time in meeting friends. No co-morbid psychiatric illness was noted so far. After abusing Ketamine, she experienced dependence features on it. She spent excessive time in getting Ketamine as she could hardly control her desire in chasing it. She felt angry and act aggressively once withdrawal from Ketamine. Moreover, she felt depressed, irritable, and difficult to fall asleep at night. Apart from health problem, Miss D had criminal record from drug related crime. She was sentenced to probation and required to provide social services with a drug related crime.

In conclusion, Miss. D is a moderate Ketamine user for 2 years with dependence features. She experienced withdrawal symptoms after stopped using Ketamine. She is a sensation seeker but not a particular impulsive person. There are obvious harmful effects shown in her physical condition as well as psychosocial aspects. Nonetheless, she has given up taking Ketamine for few months. It might due to her insight towards the harmful effects from Ketamine abuse.

Case 05

Mr. E, is single aged 20 with a higher secondary school educational level. He is a partly skilled worker without any religious background. Mr. E comes from a nuclear family who has a brother. His parents are partly skilled worker. Their family income exceeds \$30,000 per month. Regarding the personality of Mr. E, he is considered as being impulsive. He acts on impulse and buy instantly. He is happy-go-lucky and only thinks of one question at a time. However, he is not a particular sensation seeker. He likes making friends with “down-to-earth” people rather than fanciful person. He is an extrovert with divergent thinking pattern who always comes up with various ideas. He can link different ideas into a coherent pattern easily.

Mr. E started smoking and became a regular daily smoker at 13-year-old. He started to take Ketamine on weekly basis since 16. He had taken about 1,400 times of Ketamine before the interview. He usually took Ketamine at home with his friends. He preferred to use Ketamine mainly because he expected to escape from boredom under the acute drug effects. He could be problem-free and away from the reality. Moreover he liked the relaxing effect of Ketamine.

As Mr. E said, his physical condition was largely unremarkable except tiredness and difficulty to fall asleep at times. His interpersonal relationship was affected. He spent less time in meeting with friends or going out for social activities. He diverted his attention to Ketamine from his other interest. He has been dependent on Ketamine with evidence of withdrawal symptoms. Uncontrollable and persistent desire on Ketamine was

noted. Regardless of the harmful effects, Mr. E still continued to use Ketamine and gave up other activities. When Ketamine was stopped, he would feel anxious and nervous easily. He reported difficulties in falling asleep, an increase of dreaming, and having excessive yawning. He was sentenced to detention centers twice for drug-related crimes. When using Ketamine, he could stop taking it before stoned half of the time. Moreover, he did not suffer from any co-morbid psychiatric disorder.

In conclusion, Mr. E is a problem Ketamine user for 4 years with dependence features on Ketamine. He is being physiologically dependent on Ketamine. He is an impulsive extrovert with divergent thinking pattern. He primarily uses Ketamine because he would like to escape from boredom and seek for the specific pleasurable effects. Obvious harmful effects were shown from his high frequency of Ketamine use. At present, he has poor motivation to quit Ketamine.

Case 06

Mr. F is single aged 21 with higher secondary school educational level. He is a salesperson who works at a printing company without any religious background. Mr. F and his sister come from a separated family. His parents also works at printing company. Their monthly family income exceeds \$30,000.

At 7-year-old, Mr. F began his first taste of alcohol. He started smoking at 8-year-old and became a regular daily smoker at 15. At the same year, he started to abuse Ketamine with a total consumption frequency of about 200 so far. He used to take Ketamine at restaurants or bars with his friends. Meanwhile, he did not report any acute intoxication from it.

Regarding the health condition of Mr. F, he was diagnosed to have depressive episode by his doctor at 18. He had persistent depressed mood for several weeks with poor appetite, insomnia, weight loss, concentration difficulty and generalized weakness. It affected his work performance. At that time, he was taking Ketamine actively. Although he reported taking Ketamine during office hours, he denied any negative effect on his job performance. However, he missed a few appointments at work because of using Ketamine. He was preoccupied with Ketamine most of the time that he could hardly control his Ketamine intake. Though he has tried to cut down his Ketamine use, he failed to control his persistent desire to get the drug effects. He did not report any other dependence symptoms. He realized that Ketamine would cause harms on his physical well being, but he did not want to reduce the amount of intake. When using Ketamine, he

often stopped before he got stoned more than half of the time. He was arrested twice because of Ketamine possession and sentenced to detention centers.

In conclusion, Mr. F is a problem Ketamine user for 6 years without full dependence syndrome. He continues to abuse Ketamine despite the psychosocial hazards. Currently he has low motivation to abstain from Ketamine.

Case 07

Mr. G is single aged 18 with a lower secondary school educational level. He is a hawker selling fish in market. He has a Taoism religious background. Mr. G comes from a nuclear family with 2 brothers. Their family income is between \$15,000 and \$20,000 per month. His father, a chronic alcoholic, is also a hawker and his mother is a housewife. He is not particularly sensation seeking nor impulsive. Although he enjoys seeking adventure such as trying parachute jumping, he is able to control his impulse. He dislikes uninhibited parties and casual relationship. He does not consider experience seeking as an important issue in his life. Nevertheless, he thinks and plans carefully before action. He is able to control himself and make decision carefully. He is also an extrovert who enjoys meeting people and joining social gatherings.

Mr. G first started smoking at 12-year-old and became a regular daily smoker at the same year. At 14, he started experiencing illicit drugs like Ketamine, Ecstasy and Marijuana at times. He claimed that if he could choose, he preferred Marijuana because it could give him a happy feeling. For Ketamine, he opined that it had fast onset of drug effect but would drive people to become crazy. He became a regular Ketamine user on a weekly basis after several months of initiation. He had already taken Ketamine for over 400 times prior to the interview. He reported that he usually took Ketamine at least twice per month until about two months before the interview when he has stopped taking it. He usually took Ketamine at home alone. Although he expected to generate negative effects from Ketamine abuse, he could hardly control the desire of taking it. He did not report any acute intoxication from abusing addictive drugs.

Regarding the health status of Mr. G, he had rapid mood fluctuation since 11-year-old. Sometimes he had depression for few weeks with poor sleep and appetite. He was preoccupied with negative thoughts. At other times, he was particularly elated and excited. He became talkative and hyperactive. The mood fluctuation affected his study and work performance. He was diagnosed to have cyclothymia. Moreover, he developed auditory hallucinations after taking Ketamine on several occasions. It persisted for several days even after the acute drug effect had subsided. Apart from that, his physical condition deteriorated after using Ketamine. He had more headaches when compared with the time before Ketamine abusing. His concentration level decreased and he reported difficulty to recover his energy after waking up. He felt stressful and difficult to cope with daily problems. Additionally, he presented with dependence features on Ketamine. He continued to take Ketamine as he could hardly control his persistent desire despite the health problems. He even gave up all other activities just for using Ketamine. He developed withdrawal symptoms. For example, he felt weak and faint especially when he stood up. He reported fatigue, excessive yawning and difficult to fall asleep with early morning waking. Shaking of hands, tongue and eyelids were also noted. Although he tried to stop abusing Ketamine before, he failed to control his drug craving tendencies. He became tolerant to Ketamine and required to take larger dose for the same drug effect. Ketamine abuse also affected his interpersonal relationship. He has broken up with his girlfriends five times after abusing Ketamine. Moreover, he was arrested and sentenced to probation twice in which one is related to illicit drug.

In conclusion, Mr. G is a problem Ketamine user for 4 years with dependence features. He has co-morbid cyclothymia which would be the risk factor for Mr. G to take Ketamine repeatedly. On the other hand, abusing Ketamine would perpetuate the cyclothymic illness and other psychiatric illness like Ketamine induced psychotic disorder or present with persistent auditory hallucination. Mr. G primarily uses Ketamine mainly because of the desirable drug effects. He is not considered as a particular impulsive person or sensation seeker, but he is an extrovert who enjoys social interaction.

Case 08

Miss. H is a single 14-year-old female student without any religious background. She is the only daughter in her family and her parents are professionals. She does not have any criminal record, but she has been arrested because of illicit drug use. She has also been suspended from school as she used Ketamine at school hours. Concerning the personality of Miss. H, she is not considered as being particularly impulsive. She is a careful thinker who enjoys thinking about difficult questions. Moreover, she never gets bored at lessons or handling complicated tasks. She has diversified thinking and can accept ideas from different points of view. On the one hand, she enjoys seeking adventure that she would like to try high-risk sports such as bungee jump. On the other hand, she cannot understand the reason why some people may go for climbing high mountains. Thus, she is not described to be a particular sensation seeker.

Miss. H started drinking alcohol at 10-year-old. She began to smoke and became a regular daily smoker one year afterwards. At 12-year-old, Miss. H began to experience Ketamine, Ecstasy and Marijuana. However, she was particularly fond of Ketamine and used it regularly since 13-year-old. Prior to the interview, she had already taken Ketamine for approximately 200 times with a recent frequency of at least 20 times per month. She started abusing Ketamine mainly because it is easily accessible. Other than getting Ketamine conveniently, Miss H also expected to experience specific drug effect from taking Ketamine. Though she realized that she might lose her temper from taking Ketamine, she still took it frequently. She usually took Ketamine at restaurants or bars with her friends and denied any acute intoxication.

Regarding the health status of Miss. H, her physical condition has deteriorated from abusing Ketamine. Her concentration and productivity level decreased. Apart from that, Ketamine also affected her psychosocial condition. She reported being confused to understand what people are saying or getting directions mixed up. On the other hand, Miss. H experienced dependence symptoms on Ketamine. Though she recognized the hazardous effects from Ketamine abuse, she could hardly control her persistent desire in thinking about or using it. She even gave up other activities just for Ketamine use. She felt depressed, irritable, angry, and acted aggressively after stopped taking Ketamine. She reported runny nose, muscle aches and shaking of hands. Moreover, she harbored suicidal thoughts sometimes when she felt depressed. She had four previous episodes of depression. At that time, she felt particularly depressed for several weeks with retardation, fatigue and impairment in concentration and school performance. She claimed that when she was depressed, she would take more Ketamine in order to cheer up herself. When using Ketamine, she often stopped using it before she got stoned more than half of the time.

In conclusion, Miss. H is a problem Ketamine user for 2 years with physiological dependence features. She primarily started on Ketamine abuse because it was easily assessable. There is obvious health hazards developed from Ketamine abuse and her mood fluctuation is closely related to her Ketamine use.

Case 09

Miss I is single aged 20 with a higher secondary school educational standard. She is a Christian who is now being unemployed. Miss I comes from a nuclear family with a sister. Her father is a skilled manual worker and her mother is a housewife. Their monthly family income is between \$15,000 and \$20,000. Regarding the personality of Miss I, she is not a particular impulsive sensation seeker. She is happy-go-lucky but she is keen on planning. However, she enjoys novel experience seeking such as scuba diving. She would like to meet some people who are being homosexual. Additionally, she is aesthetic and self-oriented who prefers working independently under her own philosophy. She does not confront to the crowd and not afraid of solitude.

Miss I started drinking at 16 and become a regular daily smoker at 18. At 16-year-old, she started to experience illicit drugs and began to use Ketamine on weekly basis. She had been taking Ketamine everyday with a total frequency of 1,500 up to the time of interview. She usually took Ketamine at home with her boyfriend. She had tried Ecstasy, Marijuana, and Cough Mixture at times but she claimed that she preferred Ketamine mainly because she expected to get a fast onset of drug effect and give her a “light” and “floating” sensation. Apart from that, Ketamine would elevate her activity level when compared with other kinds of illicit drugs.

Miss I denied any obvious harmful effects on his physical health. She commented that her physical health condition was similar to the time before Ketamine abuse. However, she experienced dependence features on Ketamine such as having persistent

desire on Ketamine. She continued to use Ketamine despite hazardous effects occurred. She developed tolerance to Ketamine and could not cut down the dosage. She even spent excessive time in thinking about, collecting and using Ketamine. Nonetheless, she did not report having any withdrawal symptoms once Ketamine was stopped. From her past psychiatric history, she was diagnosed to have multiple personality disorder with an onset prior to the initiation of drug abuse. She would change from one personality to another from time to time. When she was in one personality, she could hardly remember exactly what happened to her at other personalities. There were totally three personalities manifested from her. For the first type, she was angry, hostile and domineering. The second type was predominated with childish and naïve character while the third type appeared mature and thoughtful. After taking Ketamine, her personality switched more often. However, she claimed that she often stopped taking Ketamine before she got stoned.

In conclusion, Miss I is a heavy Ketamine user for 2 years with physiological dependence features. She is not particularly impulsive nor sensation seeking. Obvious harmful effects were noted from her frequent Ketamine use. Her multiple personality alteration and her Ketamine abuse reinforced each other resulting in the observed harmful effects.

Case 10

Miss J is a single 21-year-old Christian working as a waitress. She has higher secondary school educational level. Miss J is the only daughter in her family. Her father works in the transportation industry and her mother is a housewife. Their monthly family income is between \$10,000 and \$15,000. Concerning the personality of Miss J, she is considered as being very impulsive. She dislikes planning and acts without thinking carefully. She has racing thoughts that she can only think of one problem at a time. Moreover, she changes hobbies and residences frequently. She buys on impulse and spends more than she earns. However, she is not described as a sensation seeker. She dislikes wild parties without rules and regulations. She enjoys meeting friends who are “down-to-earth”. She also disfavors attending adventure activities like flying an airplane. Additionally, she is an extrovert who enjoys meeting with new friends.

Miss J first started smoking at 15-year-old and became a regular daily smoker soon at the same year. Other than smoking, she began to drink at 15. At 18, she started to experience Ketamine on weekly basis for a total frequency of about 200 up to now. She usually took drugs at work alone. Miss J has tried other drugs such as Ecstasy and Marijuana on several occasions. Recently she also tried Nimetazepam for 3 times. She preferred Ketamine mainly because she did not need to think after taking it. However, she opined that she now prefers Nimetazepam than Ketamine because the preceding one is more sedating and she can more easily to avoid thinking her problem. She did not report any acute intoxication from abusing Ketamine.

Regarding Miss J's health condition, she reported more frequent headache after taking Ketamine. Her concentration level and frustration tolerance decreased. She felt irritable, hostile and act aggressively after taking Ketamine. She was dependent on Ketamine. She continued to use Ketamine despite the occurrence of harmful effects on her physical health. Tolerance to Ketamine was developed that she required to taking higher and higher doses over the past years. She was also diagnosed to have bipolar affective disorder which required in-patient treatment in mental hospital. At that time, she abused Ketamine actively. She claimed that she could control her Ketamine intake without intoxication more than half the time.

In conclusion, Miss J is a problem Ketamine user for 6 years with dependence features. She is very impulsive extrovert but not a particular sensation seeker. Obvious harmful effects have been noted from her frequent use of Ketamine in the past few years.

Case 11

Miss K is single aged 21 with a lower secondary school educational level. She is now being unemployed and she does not have any religious background. Miss K comes from a separated family with 2 sisters. His father suffers from heroin dependence and his mother is a security guard. Their family income is between \$10,000 and \$15,000 per month. She does not have any criminal record. Concerning the personality of Miss K, she is a sensation seeker but not a particular impulsive person. She does not inhibit her sensation seeking for experiencing drugs. She enjoys uninhibited parties and would like to be a mountain climber if she could. However, she is able to plan her job and future well. She seldom changes residence or hobbies. She is not considered as a happy-go-lucky person and won't be annoyed easily during lectures.

Miss K started smoking at 10. She became a regular daily smoker and began drinking alcohol at 11. She first experienced Ketamine and used it regularly on weekly basis at 18. She had already taken Ketamine for approximately 150 times with a recent frequency at least 10 times per month prior to the interview. Other than abusing Ketamine, she also experienced other illicit drugs like Ecstasy, Ice and Marijuana. However, she said she would only choose Ketamine because it made her feel comfortable, relax and problem-free. She expected to feel high, happy and more sociable from taking Ketamine. She used to take Ketamine with her friends without any special occasion. She claimed that she could almost always stop before she got stoned.

Regarding the health status of Miss K, her physical well being has deteriorated. She got more headaches, being tired easily and found it difficult to have a deep sleep. Moreover her interpersonal relationship and work performance were also affected. She broke up with her boyfriend. She has missed her work and social activities after taking Ketamine. She neither reported any dependence nor withdrawal symptoms. She did not have any past history of psychiatric illness.

In conclusion, Miss K is a problem Ketamine user for 3 years without dependence features. She started abusing Ketamine because of the fast “floating” sensation generated. Though there were obvious harmful effects being imposed on her physical and psychosocial health, she has low motivation to abstain from Ketamine.

Case 12

Mr. L is single aged 23 with a higher secondary school education level. He is a partly skilled worker who works in the transportation industry. He has no religious belief. Mr. L comes from a nuclear family with two sisters. His father is now being unemployed and his mother is a housewife. Their family income is between \$5,000 and \$10,000 per month. Concerning the personality of Mr. L, he is not considered as a particular impulsive person or a sensation seeker. He is a careful thinker and would try his best to sustain a stable job. He plans carefully for his future and saves money more than he spends.

Mr. L first started smoking and became a regular daily smoker at 19. He also began to drink alcohol at the same year. He experienced illicit drugs at 20. He has tried Ecstasy and Marijuana for several times, but he particularly liked Ketamine. He preferred Ketamine mainly because he felt comfortable and experienced the “floating” sensation of the drug effect. However, he got into a struggle that he felt happy and high, as well as felt panic and fearful at the same time after taking Ketamine. He usually took Ketamine at disco with his girlfriend. Prior to the interview, he mentioned having Ketamine intake at least 7 times per month and had already taken it for approximately 100 times. He did not report any acute intoxication after abusing Ketamine. He was dependent on Ketamine. He failed to control his desire in chasing drugs as he was persistently preoccupied with it. Moreover, he noted several withdrawal symptoms like teary eyes, rapid breathing, excessive sweating, shaking of hands and tongue, felt depressed, irritable, anxious as well as difficulty in sleep.

Regarding the health status of Mr. L, he reported deterioration of his physical condition after abusing Ketamine. He got more headaches, being tired easily and difficult to fall asleep again after waking up early in the morning. He even scared of getting faint at public areas. When he felt depressed or being unhappy, he might have some suicidal thoughts. He mentioned that he felt extremely tired that he could hardly eat anything. His productivity and work performance decreased as he suffered from insomnia nearly every night. He was diagnosed to have a depressive episode at 23 when he was actively using Ketamine. He felt persistently depressed with suicidal thoughts. His appetite, sleep and concentration level were impaired. The depressed mood continued for several more weeks even after he had stopped taking Ketamine. Apart from that, Ketamine affected his interpersonal relationship and work performance. Nevertheless, he did not have any criminal record.

In conclusion, Mr. L is a problem Ketamine user for 3 years with dependence features. He is neither described as being impulsive nor sensation seeking. He is physiologically dependent on Ketamine. He primarily uses Ketamine mainly because of the relaxation effect. In view of the health deterioration, Mr. L claimed that it is very important for him to cut down Ketamine use and it is very unlikely for him to use drugs in the future.

Case 13

Mr. M is single aged 33 with a lower secondary school educational standard. He believes in Buddhism and is now unemployed. Mr. M comes from a nuclear family with 7 siblings. His parents have retired. Their monthly family income is between \$10,000 and \$15,000. He is neither a sensation seeker nor particularly impulsive. He dislikes adventure seeking activities such as skiing. He values the purity of his wife and thinks that it is better for couples to have sex experience after marriage. He does not like those films with too many sexy scenes. He is not happy-go-lucky, but rather cautious and thinks thoroughly. He seldom changes residence or hobbies. He can think of several questions at the same time with clear decision making. However, he is a highly social tolerant person who enjoys chatting with various types of persons. He prefers meeting friends from different background and discusses with friends holding different points of views. It is difficult for him to refuse the request of his friends. He has been arrested and sentenced to prison twice for crimes not related to illicit drugs.

Mr. M started smoking and became a regular daily smoker at 9-year-old. When he was 8, he began his first taste of alcohol. At 14 years of age, he started experiencing illicit drugs like Marijuana and Ecstasy at time. However, he was particularly fond of Ketamine and used it every week since 28-year-old. In the past several months, he needed to take Ketamine everyday. He had taken Ketamine for at least 2,000 times prior to the interview. He used to take Ketamine at home alone. He preferred Ketamine mainly because he expected to get the “floating” sensation from using it. He also expected to get better sex and work performance under the drug effects. Although he realized the potential bad

consequences, he still kept on abusing it to obtain the desirable drug effects. He denied any acute intoxication from taking Ketamine.

Mr. M denied any obvious deterioration of his health condition though he felt tired easily and need to take additional vitamins after abusing Ketamine. However, Ketamine affected his mood and attitude. He thought that life is just a battle which is difficult for him to cope. He felt miserable with low self-confidence. Moreover, Ketamine affected his interpersonal relationship. He spent less time with his friends. Mr. M showed dependence features on Ketamine. He was preoccupied with Ketamine most of the time and would be craving to use it any time. He could hardly control his persistent desire to take Ketamine. Despite the hazardous effects to his psychosocial well-being, he continued to abuse Ketamine and even gave up other activities. When he stopped taking Ketamine, he experienced withdrawal symptoms. He had stomach upset, nausea and vomiting after taking Ketamine. He also mentioned having muscle aches, runny nose, excessive yawning, shaking of mouth, hands and eyelids. He felt angry, depressed and irritable during withdrawal period. When using Ketamine, he used to stop using it before he got stoned more than half of the time. He has past psychiatric illness of depressive episode at 31. At that time he worried a lot of his deteriorating physical health. He presented with persistently lowish mood for several weeks. He had difficulty in sleeping. His appetite was reduced with severe weight loss. He harbored suicidal idea although he did not act it out.

In conclusion, Mr. M is a problem Ketamine user for 5 years with physiological dependence syndrome. He is not considered as being particularly impulsive or sensation seeking. However, he is an experience-seeking person with high level of social tolerant. He primarily uses Ketamine because of the special drug effects. Although he can understand the significance of stop taking Ketamine for his health, he still has low motivation to abstain from it. At early stage it may be due to his personality that he would hardly refuse to take Ketamine under peer pressure. At later stage, it may also be due to his physiological dependence with the distressful withdrawal symptoms.

Case 14

Mr. N, is single aged 21 with a lower secondary school educational level. He is a skilled manual worker without any religious background. Mr. N comes from a nuclear family with a brother. His father is being unemployed who is now suffering from heroin dependence and his mother is an unskilled worker. Their family income is between \$20,000 and \$25,000 per month. Regarding the personality of Mr. N, he is neither described as a particular impulsive person nor a sensation seeker. He always plans his job well and makes decision thoroughly. He can control his temper and impulse. There is no particular problem for his concentration. Moreover, he can tolerate with boredom. Sometimes, he would repeat to do the same thing e.g. he enjoys watching a film many times. When he is going to a trip, he prefers having a guide rather than being alone. He would feel uncomfortable with unpredictable things and without much interest on novel experience seeking. Nonetheless, he has divergent mind that he is boastful and avoids offending others.

Mr. N started smoking and become a regular daily smoker at 16-year-old. Other than taking cigarette, he began to drink on social occasions at 17. At the same year, he started to try illicit drugs and began to use Ketamine on weekly basis. He took Ketamine at least once per month. He had already taken it for approximately 150 times in his life prior to the interview. He used to take Ketamine at restaurants or bars with his friends. He preferred to take Ketamine mainly because he expected to be more sociable under the drug effects. He claimed that he would have great fun at parties with the extra effects from Ketamine.

Mr. N realized that Ketamine would cause harm to his health, but he did not report any obvious physical health hazards. He just claimed that he needed to take additional vitamins and reported insomnia sometimes. He often stopped taking drugs before he got stoned more than half the time. After abusing Ketamine, he experienced dependence features. He had tolerance on Ketamine but without withdrawal symptoms. He spent excessive time in getting Ketamine continuously as he found it difficult to control his desire in chasing it. He gave up his other activities in order to take the drug. One episode of depressive disorder was noted when he was 18. At that time, he had severe depressed mood with guilt feeling and suicidal thoughts. His sleep and appetite was impaired with obvious weight loss. During that period, he was actively using Ketamine regularly. Moreover, he has been sentenced twice to probations due to drug-related crime.

In conclusion, Mr. N is a heavy Ketamine user for 4 years with dependence features. He is physiologically dependent on Ketamine. He did not report any physical deterioration from Ketamine abuse during the interview. He primarily used Ketamine because of peer influence and the desirable drug effects. He is neither a sensation seeker nor a particular impulsive person. However, he can hardly refuse his friends' requests on having Ketamine. He has no motivation to abstain from Ketamine.

Case 15

Mr. O, is a single 19-year-old student with a higher secondary school educational level. He has no religious background. Mr. O comes from a nuclear family with three siblings. His father is being unemployed and his mother is a cleanser. Their family income is between \$5,000 and \$10,000 per month. Concerning the personality of Mr. O, he is not considered as being impulsive or a particular sensation seeker. Though he enjoys seeking adventure sometimes, he controls his impulse well. He is an extrovert who enjoys meeting friends and communicating with strangers. However, he is defensive and he believes that his ability is much better than others.

Mr. O started smoking and drinking simultaneously at 16-year-old. He first experienced Ketamine at 18 and began to use it on weekly basis about one year later. He had taken Ketamine for about 100 times with recent frequency at 12 times per month prior to the interview. He usually took Ketamine at disco with his friends. He preferred to use Ketamine mainly because he expected to have an increased activity level and better mood from the drug effects.

Although Mr. O recognized that Ketamine would lower his thinking ability, he continued to use it regardless of the potential harmful effects on his cognitive function. He opined that there was no obvious physical symptom so far. However, his psychosocial conditions worsen after taking Ketamine. He participated less frequent in social activities. He was being arrested for a drug-related crime and has been sentenced to probation for a non-drug related crime. Moreover he experienced a series of dependence symptoms. He

possessed persistence desire to take Ketamine. He spent excessive time in chasing it and gave up his other activities. He developed tolerance and required to increase the amount of dosage for the same drug effect. No withdrawal symptom was noted so far. When abusing Ketamine, he would probably stop before getting stoned. There was no co-morbid psychiatric illness identified.

In conclusion, Mr. O is a moderate Ketamine user for 1 year with dependence features. He experienced physiological dependence features on Ketamine in the past few years. He is neither described as a particular sensation seeker nor being impulsive. He primarily uses Ketamine because of the pleasurable drug effects. Although he has experienced a decline in psychosocial well being, he denies any physical health hazard.

Case 16

Mr. P is a single 23-year-old chef with a higher secondary school educational level. He has no religious belief. He and a sister come from a nuclear family. Their monthly family income is between \$10,000 and \$15,000. Regarding the personality of Mr. P, he is described as impulsive but not a particular sensation seeker. He is only interested in present things rather than the future. He always makes decision on impulse and without any constant saving. Additionally, he dislikes excitement-seeking experience. He believes that it is better for two married person to have sex experience with each others.

Mr. P started smoking and became a regular daily smoker at 14-year-old. He became an occasional alcohol drinker at 16. At 20-year-old, he experienced illicit drugs and started abusing Ketamine at the same year on weekly basis. He had used Ketamine for approximately 1,100 times in the past nine years with a recent frequency of 12 times per month prior to the interview. He usually took Ketamine at home with his friends. He preferred to use Ketamine mainly because he expected to have more fun at parties from it. He also expected to have a different feeling from taking Ketamine when compared with drinking alcohol. He denied any acute intoxication from Ketamine.

Concerning the physical well being of Mr. P, he denied any obvious harmful effects from abusing Ketamine. He even claimed that he had better health condition as well as an increase in decision-making ability. He described that he was more sociable and caught more attention from others under the Ketamine effects. On the other hand, Mr. P experienced dependence symptoms on Ketamine. He reported persistent and

uncontrollable desire in chasing Ketamine. His Ketamine dosage level increased with time. He was preoccupied with Ketamine that he could hardly cut down his use. Once he started taking Ketamine, he usually took more than he intended. After omitting Ketamine, he felt fatigue, excessive yawning, increased dreaming and difficult to fall asleep at night. He was arrested twice for crimes that are related to drugs. No co-morbid psychiatric illness was noted so far.

In conclusion, Mr. P is a heavy Ketamine user for 3 years with dependence features. He is physiologically dependent on Ketamine with evidence of tolerance and withdrawal symptoms. He is considered as being impulsive, but not being sensation seeking. He primarily takes Ketamine because of its specific drug effects. He denies any obvious harmful effects made when compared with the time before abusing drugs.

Case 17

Mr. Q, is single aged 22 with a lower secondary school educational level. He is a skilled manual worker with a Buddhism background. Mr. Q comes from a single family who has a sister. His father passed away and his mother is a merchant. Their family income is between \$15,000 and \$20,000 per month. Concerning the personality of Mr. Q, he is not considered as a sensation seeker or an impulsive person. He always thinks carefully before he takes action. He never acts or speaks impulsively. He also plans well for his future. Moreover, he is gracious and being socially tolerant. He is not calculating and treats others leniently. He is open-minded and enjoys meeting new friends with different personalities.

Mr. Q started smoking regularly at 18. He first experienced Ketamine at 19 and began to take it on a weekly basis at 22. He has consumed about 100 times of Ketamine with a recent frequency of at least 8 times per month prior to the interview. He usually took Ketamine at restaurants or bars with his friends. He preferred Ketamine mainly because he expected it to reduce his boredom. Although he understood the negative consequences from Ketamine, he reported having an extremely joyful feeling after taking it. He opined that he would have more fun at parties under the active drug effects. Moreover, he believed that Ketamine is safer than other kinds of illicit drugs which cause various harmful effects to people.

Mr. Q denied any harmful effects from Ketamine abuse. Apparently, he felt that he was more energetic at his work and his productivity level increased. However, his

interpersonal relationship was affected after abusing Ketamine. He reported less social activities with friends when compared with the time before taking Ketamine. There were obvious dependence features on Ketamine noted. Mr. Q persistently used Ketamine in an increasing amount and developed a tolerance on Ketamine. He could hardly control his desire in getting or using Ketamine. Though he realized the undesirable effects generated by Ketamine, he continued to take it and neglected the harmful effects being made. However, he denied any physiological withdrawal symptom. He did not suffer from co-morbid psychiatric illness. He also denied any acute intoxication from using Ketamine.

In conclusion, he is a heavy Ketamine user for less than a year with dependence features. He primarily uses Ketamine because of its mood alteration effect. He is a socially tolerant person who accepts different things easily. It is often difficult for him to refuse his friends offering him Ketamine. He realizes that Ketamine has caused hazards to his psychosocial well being and is unlikely for him to continue to abuse Ketamine.

Case 18

Mr. R is a single 17-year-old form 3 student without any religious background. Mr. R comes from a large family with six siblings. His parents are being unemployed and one of his sister is suffering from drug abuse. Regarding the personality of Mr. R, he is a sensation seeker who is not impulsive. He enjoys seeking novelty with high level of sensation seeking tendencies. He often thinks that he could be a mountain climber. He would like to explore a strange city regardless of the risk in getting lost. He is also a divergent thinker who is able to think from different points of view. He has different hobbies and prefers meeting people with different races. He believes that taking risk is needed for self-improvement.

Mr. R started smoking and became a regular daily smoker at 13-year-old. At the same year, he began to experience illicit drugs. He has tried Ecstasy and Marijuana for several times. At 14, he started to use Ketamine and became a regular Ketamine user a year afterwards. He used to take Ketamine at restaurants or bars with his friends. He has already taken Ketamine for over 1,000 times. He would mainly choose Ketamine because of the special funny feeling as well as the floating sensation. He believed that he can control these feelings by his thoughts under Ketamine effect. He also expected to reduce tension from taking Ketamine. After taking Ketamine, he would not be annoyed easily. He did not report any acute intoxication so far.

Mr. R believed that his health condition was even improved after taking Ketamine. He claimed that his work performance and concentration level were better. However, his

interpersonal relationship was affected from using the illicit drug. Although he described himself as sociable and friendly, he reported less social gathering with his friends. He broke up with his girlfriend owing to Ketamine abuse. He expressed that he had free-floating anxiety at times. He sometimes used drugs when he went to school that it disturbed his school life. Apart from that, he missed school because of getting stoned from Ketamine. He was dependent on Ketamine with evidence of physiological features. Despite the harmful effects, he continued to use it and even gave up other activities. He could hardly control his preoccupation in chasing Ketamine as he developed a tolerance to it. After stopped taking Ketamine, he felt angry, depressed, being irritable and acted aggressively. He had been arrested and sentenced to compulsory detoxification for a drug-related crime. Moreover, he had vivid and persistent auditory hallucination after taking Ketamine on several occasions. When using Ketamine, he claimed that he could almost always stop using it before he got stoned.

In conclusion, Mr. R is a former Ketamine user who is currently abstaining. He primarily used Ketamine to seek for the specific desirable drug effects. He can recognize the significance of cutting down drug use after experiencing the hazardous consequences from taking Ketamine. He claimed that it is unlikely for him to use Ketamine again in the future.

Case 19

Mr. S is single aged 19 with a lower secondary school educational level. He is an unskilled worker who works in a photocopying company. He has no religious belief. He comes from a family with four siblings. Their monthly family income is between \$5,000 and \$10,000. He does not have any criminal record. Concerning the personality of Mr. S, he is described as an impulsive sensation seeker. He always acts on impulse as well as being annoyed easily during lectures and seminars. Other than being impulsive, he can hardly inhibit his sensation seeking tendencies. He dares to try new drugs that provide hallucinations. Moreover, he likes to try new things that are a little frightening. He would like to seek for novel experiences even if they are unconventional or illegal.

Mr. S started smoking and became a regular daily smoker at 14-year-old. Two years later, he began to drink alcohol as well as first experiencing illicit drugs. At 16, he started taking Ketamine on weekly basis in disco with his friends. Prior to the interview, he had already consumed 400 times of Ketamine with a recent frequency at 20 times per month. Other than taking Ketamine, he also used Ecstasy, Ice and Marijuana on occasional basis without regular use. He claimed that Ketamine could be assessed easily than other kinds of illicit drugs, thus he used Ketamine more often. He started abusing Ketamine mainly because he expected to get a special feeling from taking it. He would expect to get more fun at parties and become more sociable.

Mr. S described having similar physical condition when compared with the time before abusing Ketamine. He only reported difficulties to fall asleep at night. Mr. S

experienced dependence features on Ketamine. He had persistent desire to take Ketamine and spent most of his time thinking about and using it. Despite harmful effects generated from Ketamine abuse, he could hardly reduce or stop abusing it. He developed tolerance to Ketamine, but he did not experience any withdrawal features. No co-morbid psychiatric disorder was noted so far. When abusing Ketamine, he claimed that he could usually stop before he got stoned.

In conclusion, Mr. S is a problem Ketamine user for 3 years with physiological dependence features. He primarily uses Ketamine mainly because he can get it conveniently. No obvious harmful effects are reported.

Case 20

Miss T is a single 17-year-old form 5 student without any religious background. Miss T comes from a nuclear family without any siblings. Her mother is a housewife with psychiatric illness. She does not have any criminal record. Regarding the personality of Miss T, she is considered as a sensation seeker, but not particularly impulsive. She can concentrate easily and never act on impulse. Moreover, she always thinks and plans carefully. She enjoys adventure seeking activities such as flying an airplane and scuba diving. She also wants to make new friends who are homosexual as it might be a kind of unusual experience. She would be impatient in meeting with friends who are boring.

Miss T started smoking and became a regular daily smoker at 12-year-old. She began to drink alcohol one year afterward. At 15, she first experienced illicit drugs and began to take Ketamine on a weekly basis. She has taken Ketamine for about 200 times. Other than taking Ketamine, she also tried Marijuana at times. She preferred Ketamine because it provided faster drug effects than other kinds of illicit drugs. She usually took Ketamine with her friends without any specific occasion. After taking Ketamine, she expected to get a high feeling and get more fun at parties. She opined that using Ketamine gave her a totally different feeling from drinking alcohol. Additionally, she did not experience any acute intoxication from abusing Ketamine.

Miss T denied any deterioration of her health condition. Though she had difficulty to fall asleep, she reported having better decision-making abilities when compared with the time before using Ketamine. Apparently, her school performance was improved as

she became more energetic. However, her interpersonal relationship was affected after abusing Ketamine. She mentioned spending less time to attend social activities. Although she realized the harmful effects being imposed, she could not resist her strong desire in thinking about or using Ketamine. She reported tolerance on Ketamine, but she did not experience any withdrawal symptom from it.

In conclusion, Miss T is a problem Ketamine user for 2 years with dependence features. She primarily takes Ketamine mainly because it generates faster drug effects when compared with alcohol or Marijuana. She has low motivation to abstain from Ketamine.

Case 21

Mr. U is a single 18-year-old art student who is studying for his first year higher diploma course. He has no religious background. He comes from a nuclear family with a sister. Their monthly family income is between \$5,000 and \$10,000. His father is currently unemployed and his mother is a general care assistant at elderly home.

Concerning the personality of Mr. U, he is considered as a sensation seeker. He enjoys adventures as well as high sensation activities such as wild parties and parachute jumping. He would like to try new drugs that produce hallucinations. He has difficulty to inhibit his sensation seeking tendencies that he likes to date person who is physically exciting. Additionally, he is also an impulsive person. Take for example, he has racing thoughts and being restless in theaters and lectures. It is difficult for him to concentrate on particular task or people as he always has a drive to try new things.

Mr. U started smoking at 14 years old and become a regular daily smoker in the same year. Other than smoking, he began to be a social drinker at 16. He started to take Ketamine at 16 and had used 30 times. He used to take Ketamine at restaurants or bars with his friends. He liked Ketamine mainly because he expected to reduce stress after taking it. He opined that taking Ketamine gave him the relaxation feeling. Moreover, he also expected to get high feelings from taking the drug. He did not experience any acute intoxication from Ketamine and said that every time he could stop taking it before intoxication.

Mr. U's noticed that his physical health condition had deteriorated. He had difficulty to sleep and often woke up early in the morning. His school performance and interpersonal relationship were affected. He got angry easily and spent less time in social gathering with friends. He felt stressful and helpless in solving daily problems. His productivity decreased as he experienced free-floating anxiety and panic. When he stopped taking Ketamine, withdrawal symptoms occurred. He reported fatigue and excessive yawning during withdrawal. He also felt anxious and nervous at that time. Although withdrawal symptoms persisted in Mr. U, he denied any other dependence features on Ketamine. For example, he denied preoccupation, uncontrollable urge to take Ketamine and tolerance development.

In conclusion, Mr. U is a recreational Ketamine user for 2 years without fulfilling the full DSM-IV criteria for dependence syndrome. He primarily used Ketamine because of peer influence. He is an impulsive sensation seeker. Although he is a recreational user with relatively low frequency of consumption, Ketamine has already impaired his physical and psychosocial well being.

Case 22

Mr. V, is single aged 19 with a lower secondary school educational level. He is a partly skilled worker in a hair salon. He believes in Buddhism. Mr. V comes from a divorced family with a brother. His father is being unemployed and his mother is a housewife. Their family income is between \$20,000 and \$25,000 per month. Regarding the personality of Mr. V, he is an impulsive sensation seeker. He gets bored easily with same old faces and would like to try new drugs that can produce hallucinations. He prefers adventure activities like diving and parachute jumping. Moreover, he usually spends more than he earned without any saving plan. He cannot stand for boredom especially during lectures and seminars.

Mr. V started smoking at 13-year-old and become a regular daily smoker at the same year. Other than taking cigarette, he began to drink and started to experience Ketamine at 17. He used Ketamine on weekly basis at the very beginning. He had used Ketamine for about 150 times with recent frequency of at least 3 times per month prior to the interview. He used to take the drug at restaurants or bars with his friends. He preferred to use Ketamine mainly because he expected to be more relaxing from using Ketamine as compared to alcohol and other illicit drugs. Although he expected to experience negative effects after taking Ketamine, he kept on using it by the relaxation effect gained from it. He did not report any acute intoxication from taking Ketamine.

Mr. V reported obvious harmful effects from Ketamine use. His concentration level as well as the decision making abilities were impaired. He felt gloomy to his future

and found it difficult to start new tasks. He lost interest in interpersonal relationship and spent less time in social activities. However, his self image was exaggerated under Ketamine effect. At that time, he could feel that he was superior to others. No co-morbid psychiatric illness was noted so far. Moreover, he could stop taking drugs before he got stoned. However, he has been sentenced to probation in two crimes that are related to drugs. He denied any dependence or withdrawal features on Ketamine use.

In conclusion, Mr. V is a heavy Ketamine user for 2 years without dependence features. He is described as an impulsive sensation seeker. He enjoys seeking novelty like taking drugs and finds it difficult to confront failure. He primarily uses Ketamine mainly because of its relaxation drug effect. Obvious harmful effects are present. However, he has low motivation to abstain from Ketamine.

Case 23

Mr. W, is a single 16-year-old form two student without any religious background. Mr. W comes from a single family with one sister. His father passed away and his mother is currently unemployed. Their monthly family income is less than \$5,000. Regarding the personality of Mr. W, he is described as a mild sensation seeker who is not being impulsive. He likes to explore a strange city by himself regardless of the risk of getting lost. Although he would like to take adventures, he is able to control his impulse. He dislikes people who are uninhibited and casual in sex. Moreover, he is a divergent thinker with high level of interpersonal tolerance. He accepts opinions from different people with different points of view.

Mr. W started alcohol drinking at 13-year-old and became a daily smoker at 14-year-old. He began to take Ketamine at 15 because he expected Ketamine to reduce his tension with a peaceful time. Under the drug effect, he could escape from the reality and absorb in a dream like state. However he did experience negative effects like thirsty. He had used Ketamine for about 20 to 30 times prior to the interview and he took it twice per month. He usually took Ketamine at schools with his friends. He claimed that he could control his Ketamine use by stopping it before he got stoned.

Mr. W denied any problem in his physical health. However, he mentioned loss of interest in daily activities especially social interaction. He encountered difficulties in solving problems in his daily life. He felt depressed, irritable and angry easily. He reported nightmare and suicidal thoughts. He claimed that he would continue to use it

despite the harmful effects. He also reported withdrawal symptom such as irritability, depression, hostility, and increased dreaming. However, he did not fulfill the full criteria for DSM-IV dependence syndrome. On the other hand, he was diagnosed to have depressive episode in the past. After abusing Ketamine, Mr. W encountered social problems. He broke up with his girlfriends four times. He was expelled from school since he used drugs at school. Moreover he was arrested once due to a crime related to illicit drugs.

In conclusion, Mr. W is a moderate recreational Ketamine user for 1 year without meeting full DSM-IV criteria of dependence syndrome. He primarily uses Ketamine because of the desirable effects. He is a sensation seeker but not particularly impulsive. Although he has no obvious physical problem, his psychosocial well being has been impaired from Ketamine abuse. Thus, he has already stopped using Ketamine.

Case 24

Mr. X is single 26-year-old with a higher secondary school educational level. He is a partly skilled worker who works in the transportation industry without any religious background. Mr. X comes from a nuclear family with two sisters. Their family income exceeds \$30,000 per month. Concerning the personality of Mr. X, he is not considered to be a sensation seeker. He does not enjoy sensation seeking activities such as skiing or bungee jump. However he describes himself as an impulsive person. He feels bored easily and he can hardly concentrate on his work for long period of time.

Mr. X started smoking at 15-year-old and became a regular daily smoker at 17. Other than smoking cigarette, he began to drink at 17. Moreover, he started to experience Ketamine at 24 and had already taken it for 30 times so far. He usually took Ketamine at restaurants or bars with his friends. He started abusing Ketamine mainly because he expected to reduce tension after taking it. For instance, he would not be annoyed easily under the drug effect. Moreover, he expected to have more fun and excitement in the party if he took Ketamine. He claimed that he could control himself by stopping using Ketamine before he got stoned. Thus he had never experienced any acute intoxication from Ketamine.

Regarding Mr. X's health status, he did not complain any physical symptoms. He denied any harmful effects from taking Ketamine. He claimed that his physical well being was the same as the time before abusing Ketamine. Moreover, Mr. X did not report any features of Ketamine dependence. No withdrawal symptom was experienced when he

stopped using Ketamine. Moreover, no comorbid psychiatric illness was noted. After abusing Ketamine, Mr. X opined that there was no undesirable effect on his interpersonal relationship and work performance. He did not have any criminal record. Mr. X has stopped taking Ketamine for four months before the interview because he worried that it would cause harm to his health if he continued to use it.

In conclusion, Mr. X was a recreational Ketamine user for about one year without dependence features. He primarily used Ketamine because of peer influence. He is impulsive, but not a particular sensation seeker. He considered Ketamine use as a kind of recreational experience indeed. No obvious harmful effect was noted so far. It may be due to his short duration of Ketamine abuse in the past few years. Moreover, he realized that drug abstinence would be very important for his health condition. Thus he stopped using Ketamine.