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台北都會區菸酒慣用者之

愷他命期待與愷他命終生使用經驗

Ketamine Expectancy and Lifetime Use Experience of  
Ketamine among Regular Alcohol and Tobacco Users  
in Taipei Metropolitan Area

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學流行病學與預防醫學研究所完成之碩士學位論文，於民國  
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## 中文摘要

**目的：**本篇研究主要的目的有二，其一是分別探討愷他命的正向及負向期待分數和愷他命過去的終生使用經驗是否有所相關；其二是利用正向和負向期待的高低分數組合去了解各種期待分數組合和愷他命過去的終生使用經驗以及相關行為是否有所相關。

**方法：**將 2007 年到 2010 年以「回應者引介抽樣法」在大台北地區收集的菸酒慣用者作為研究的樣本的來源，四年所蒐集的樣本數總共為 1130 人。我們將樣本中未完成愷他命期待問卷以及未曾使用過愷他命但是曾使用過其他非法藥物的使用者在分析前事先挑出，最後有 1012 人納入研究分析。每一位受訪者都利用電腦經過了「自我訪談式問卷」的資料蒐集，分別蒐集了愷他命的期待分數、藥物的終生使用經驗以及其他面向的測量。利用卡方檢定或是變異數分析做群組間的比較，並且以多分類反應變數的羅吉斯回歸做為依變項和自變項之間相關程度的分析。

**結果：**以過去使用愷他命的經驗將樣本分為未使用非法藥物( $n = 845, 83\%$ )、僅使用愷他命( $n = 30, 3\%$ )以及曾合併愷他命以及其他藥物使用( $n = 137, 14\%$ )三組。以三組不同的愷他命終生使用經驗作為依變項與正向和負向的愷他命期待進行多分類反應變數的羅吉斯回歸。以未使用非法藥物的組別做為參考組，發現正向的愷他命期待和過去僅使用愷他命的組別( $OR = 1.51, p < 0.01$ )及過去曾有合併愷他命以及其他藥物使用的組別( $OR = 1.68, p < 0.001$ )有顯著的正向相關；而負向的愷他命期待則和過去僅使用愷他命的組別( $OR = 0.80, p < 0.05$ )及過去曾合併愷他命以及其他藥物使用的組別( $OR = 0.70, p < 0.001$ )有顯著的負向相關。之後以未使用非法藥物的組別分別在正向以及負向的愷他命期待的中位數作為切點，將兩種期待分數分別進行高低分的區分後再加以組合，以正向分數低負向分數高的組別做為參考組，再和不同的愷他命終生使用經驗進行多分類反應變數的羅吉斯回歸，發現在正向分數高負向分數低的組別與過去僅使用愷他命的組別( $OR = 3.28, p < 0.05$ )

及過去曾有合併愷他命以及其他藥物使用的組別( $OR = 41.21, p < 0.0001$ )有顯著的正向相關。

**討論與結論：**本研究針對新興藥物-愷他命進行愷他命終生使用經驗與其期待分數的分析，了解了不同的愷他命終生使用經驗對於期待分數的關係，對於未來進一步的愷他命的防治或是介入提供了新的資訊可以參考。



## Abstract

**Aims:** The present study aimed to (a) examine whether the positive and negative expectancy, respectively, was associated with ketamine-using behavior, and (b) explore the relationship between different combinations of dichotomized positive-negative expectancy and ketamine-using behavior.

**Methods:** Study subjects were participants recruited by using respondent driven sampling among regular alcohol and tobacco users in Taipei metropolitan area from 2007 to 2010. The total number of newly-recruited subjects in each year during the 4 years was 1130. After excluding subjects whose repertoire of illegal drug use did not include ketamine, or who failed to complete the questionnaires on expectancy, the final sample size for this study was 1012. Each participant underwent an audio computer-assisted self-interview for previous experience of drug use, expectancy of ketamine use, and other measurements. Group comparisons were conducted using either chi-square test or ANOVA, and correlates of a multi-group outcome were examined using multinomial logistic regression.

**Results:** According to ketamine-use experience, subjects were categorized into 3 groups: illegal drug naïve (N = 845, 83%), ketamine use only (N = 30, 3%) and ketamine use with other drugs (N = 137, 14%). Results from multinomial logistic regression analysis indicated that positive expectancy was positively associated with ketamine use only

(OR = 1.51,  $p < 0.01$ ) and ketamine use with other drugs (OR = 1.68,  $p < 0.001$ ); in contrast, negative expectancy inversely associated with ketamine use only (OR = 0.80,  $p < 0.05$ ) and ketamine use with other drugs (OR = 0.70,  $p < 0.001$ ). Then we used the median of positive and negative expectancy among illegal drug naïve, respectively, to dichotomize expectancy into high vs. low subgroups. Using the subgroup of low-positive plus high-negative as reference, the results of multinomial logistic regression analysis revealed that subgroups of high-positive plus low-negative was positively associated with ketamine use only (OR = 3.28,  $p < 0.05$ ) and ketamine use with other drugs (OR = 41.21,  $p < 0.0001$ ).

**Discussion and Conclusions:** This study helped shed light on the relationship between different ketamine-using patterns and ketamine expectancy, and then provided new information for the intervention or prevention of ketamine use.

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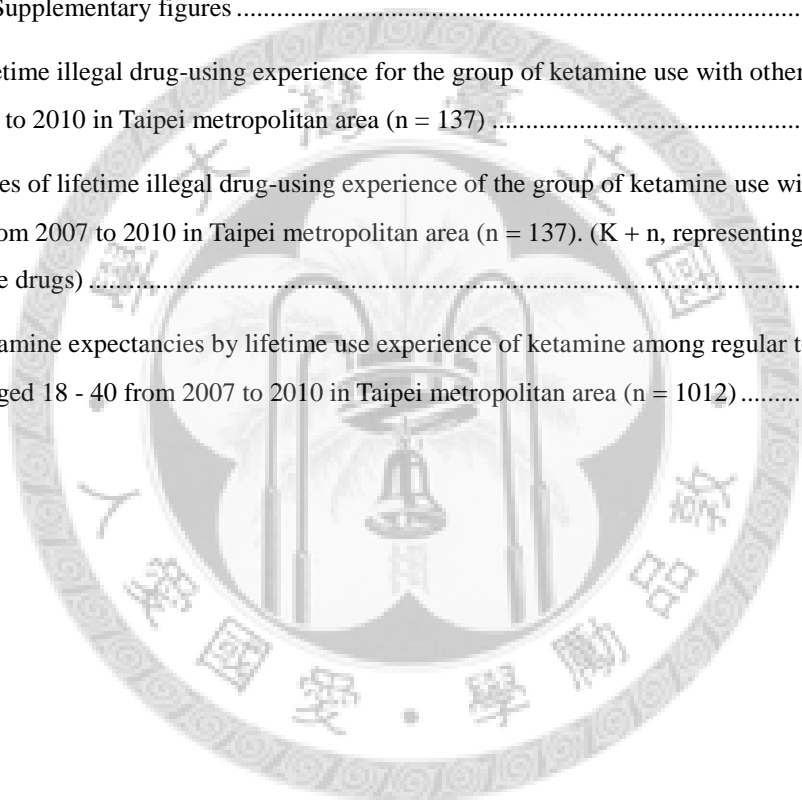
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# 1. Introduction

Ketamine, synthesized as an anesthetic in the 1960s, was initially used for American soldiers with war injuries during the Vietnam War in the early 1970s (Domino, 2010). Because of its accompanied effects and emerging club-drug culture, ketamine was mixed with ecstasy for sale starting in the 1990s (Morgan & Curran, 2012). Since 2000, the popularity of ketamine for recreational use among young people began to increase (United Nations Office on Drug and Crime, 2011), particularly in Asia (Li et al., 2011). The consumption of ketamine can lead to a variety of health problems, such as cognition impairment, kidney dysfunction, and accidental deaths (Freese et al., 2002; Shaw, 2009; Morgan & Curran, 2012). In addition, ketamine was often used with other drugs simultaneously or in sequence, resulting in even more severe health problems (Lankenau & Clatts, 2005; Grov et al., 2009). An emerging trend of increasing popularity of ketamine use among adolescents has been noted in a recent national survey in Taiwan (Chen et al., 2009).

Previous studies have indicated that understanding people's expectations of a particular drug use is important for its interventions and preventions (Christiansen et al., 1989; Goldman, 1999). Substance use expectancies represent specific anticipated effects from using substance in question (Jones et al., 2001). In general, expectancy is classified into positive and negative (Stacy et al., 1996), with a high positive

expectancy associated with strong endorsement or desire of substance use and a high negative expectancy with the shunning of such use. Expectancies for a particular substance might be established indirectly (e.g., mass media, social norm or seeing perceived drug effects from others) for those who did not use the substance (Hayaki et al., 2008). Therefore, expectancies could be a predictor for substance using among people who have not yet experience the substance. In addition, once people begin to use particular substance, direct drug effects might influence the existing expectancies. Thus, change of expectancy might affect an individual's decision to keep either substance use or abstinence, and could serve as the means for alleviating people's use of substance (Hayaki et al., 2008).

The utility of expectancy has been thoroughly demonstrated in the literature on alcohol consumption (Hull & Bond, 1986; Christiansen et al., 1989; Darkes & Goldman, 1993; Jones & McMahon, 1994; Jones et al., 2001; Palfai & Wood, 2001). Similar applications have been conducted for illegal drug use, such as marijuana and cocaine (Schafer & Brown, 1991; Stacy et al., 1991; Galen & Henderson, 1999; Hayaki et al., 2008; Hayaki et al., 2010). It remains little known about young people's expectancies on ketamine and whether such expectancies are related to their ketamine-related drug-using behavior. In addition, previous studies stated that positive and negative expectancy were independent frameworks, reflecting different

anticipations for particular responses if the use behavior occurs (Stacy et al., 1996).

However, since people usually hold both positive and negative expectations simultaneously, considering one dimension of expectancies might not reflect the desire of drug use accurately.

To fill in the gaps in the literature, this study examined the ketamine expectancies among young people in Taiwan with different levels of ketamine use, i.e., none, ketamine use only, and ketamine with other illegal drug use. The specific aims of this study were to: 1) examine whether the positive and negative expectancy of ketamine use, respectively, was associated with ketamine-using behavior, and 2) explore the relationship between different combinations of dichotomized positive- and negative-expectancy of ketamine and ketamine-using behavior.

## **2. Methods**

### **2.1. Study sample**

Study subjects were participants recruited using respondent driven sampling (RDS) among regular alcohol and tobacco users in Taipei metropolitan area from 2007 to 2010. The study was described in more detail elsewhere (Ting et al., 2012). Briefly, every seed was asked to recruit their friends who were regular tobacco and alcohol users with age from 18 to 40 years. When their peers were introduced to this study, these newly recruited subjects were also asked to refer their peers. We would

offer some incentive payments for subjects if they recruited their peers successfully. The total number of newly-recruited subjects in each year during the 4-year period was 1130 persons. After excluding subjects whose repertoire of illegal drug use did not include ketamine, or who failed to complete the questionnaires on expectancy, the final sample size for this study was 1012, or 89.6% of the total respondents were included for this study.

## **2.2. Measure**

Every participant in this study underwent an Audio Computer-Assisted Self-Interviewing (ACASI) to fill out questionnaire. The advantage of using ACASI is that the information of subjects could be saved directly without being known to research assistants. In this way, subjects could be encouraged to provide information on sensitive behavior such as the experience of illegal drug use (Wang et al., 2005).

### **2.2.1. Personal history**

Data collection included age, gender, years of education, employment (people who had job or were part-time students), and family history of drug use (any one of subjects' parents had ever used tobacco, alcohol or betel nuts).

### **2.2.2. Ketamine expectancy**

The ketamine expectancy questionnaire was modified from Adolescent Cannabis Expectancy Questionnaires (ACEQ) (Willner, 2001) by replacing cannabis with

ketamine. The original ACEQ consisted of both positive (e.g., I believe that smoking cannabis helps you stand up to others) and negative (e.g., People break and destroy things when they are smoking cannabis) dimensions, with each consisting of 6 true/false items (Willner, 2001). After replacing cannabis with ketamine, the internal consistencies (Cronbach's  $\alpha$ ) of the ketamine expectancy questionnaire in this study sample, 0.73 for the positive expectancy and 0.87 for the negative expectancy, were equivalent to those reported in the original cannabis questionnaire (Willner, 2001). In confirmatory factor analysis, the adjusted goodness of fit index was 0.90, and the root mean square error of approximation was 0.08, and comparative fit index was 0.92, indicating acceptable fits.

In addition to treating the score in positive or negative expectancy as continuous counts, we also used the median of positive expectancy and negative expectancy among people who have not yet used ketamine, respectively, to dichotomize positive and negative expectancies into high versus low subgroups. A combination of dichotomized positive-negative expectancy led to four subgroups: high-positive/low-negative, high-positive/high-negative, low-positive/low-negative, and low-positive/high-negative. We assumed that the order of above combinations represented the desire of ketamine use from strong to weak.

### **2.2.3. Drug use history**

The measures on drug use included lifetime experience of 9 illegal drugs (i.e., ketamine, ecstasy, super glue, methamphetamine, flunitrazepam [so-called FM2], marijuana, heroin or morphine, angel dust, gamma hydroxybutyrate [GHB] ). For those who had ever used each of the illegal drugs, more detailed information was asked, including the age of initial use, the cumulative frequency of lifetime use, recent use, the frequency of use in past year, and drug-related behaviors (i.e., seeking help and social function impairment).

We defined ‘illegal drug naïve’ as people who never had experience with illegal drug use, ‘ketamine use only’ as people who had ever used ketamine but never used other illegal drugs, and ‘ketamine use with other drugs’ as people who had ever used ketamine and other illegal drugs simultaneously or in sequence.

### **2.3. Data analysis**

Comparisons among the three ketamine-using groups (i.e., illegal drug naïve, ketamine use only, and ketamine use with other drugs) were conducted using chi-square test for categorical variables and analysis of variance for continuous variables. To adjust for potential confounders in comparing different groups of ketamine-using experience, either multivariable logistic regression analysis (e.g., whether seeking help or not) or multinomial logistic regression analysis (e.g., three



ketamine-using groups) was used. All statistical tests were two-sided, and a p-value < 0.05 was considered significant. All of statistical analyses were performed using the SAS 9.2. (SAS Institute, Cary, NC).

### **3. Results**

#### **3.1. Demographics, ketamine-using history and ketamine-using experience**

In a total of 1012 subjects, 845 (83.4%) were illegal drug naïve, 30 (3.0%) ketamine use only, and 137 (13.5%) ketamine use with other drugs. For the group of ketamine use with other drugs, the most commonly used other illegal drug was ecstasy (n = 117, 85.4%), followed by marijuana (n = 93, 67.9%), methamphetamine (n = 44, 32.1%), FM2 (n = 20, 14.6%), and heroin (n = 16, 11.7%).

Table 1 shows the distribution of sociodemographic characteristics, and ketamine-using history among the three groups of ketamine-use experience. The results revealed that education, family history of substance use, and age were significantly different among the three groups of people with ketamine-using experience. When the group of ketamine use only was compared with the group of ketamine use with other drugs, the latter had older initiation age of ketamine use, longer duration of ketamine use, and higher proportion with 5-time and more use of ketamine than the former.

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Insert Table 1 about here

---

### **3.2. Ketamine expectancy and ketamine-using experience**

Scores for subscales of ketamine expectancy are displayed in Table A1 in Appendix. An increasing trend for the means of positive expectancy among the three ketamine-use groups was found, with ketamine use with other drugs the highest, followed by ketamine use only, and then illegal drug-naïve, whereas the trend for means of negative expectancy among the three groups was in opposite direction (Table 2). The trends in the means of positive or negative expectancy were confirmed using multinomial logistic regression analysis with adjustment for the sociodemographic covariates listed in Table 1.

After dichotomizing positive and negative expectancy, respectively, and combining these subgroups into four combinations, we found that the proportion of high-positive/low-negative for ketamine use with other drug was the highest and that for illegal drug naïve was the lowest. Nevertheless, the proportions of low-positive/high-negative expectancy across different ketamine-using experience were opposite. After adjusting the demographic variables, the association estimates were higher for subjects with ketamine-using experience than those for illegal drug

naïve. For example, regular tobacco and alcohol users with high-positive/low-negative expectancy had higher risk to be ketamine use only, and had much higher risk to be ketamine use with other drugs.

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Insert Table 2 about here

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### **3.3. Combinations of dichotomized positive-negative expectancy and drug-related behavior**

In order to understand the applications of expectancy among ketamine users (including both groups of ketamine use only and ketamine use with other drugs), we examined the association between combinations of dichotomized positive-negative expectancies and drug-related behavior in terms of their social function impairment and seeking help (Table3). Logistic regression analyses indicated that combinations of dichotomized positive-negative expectancies were not related to any one of drug-related behavior.

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Insert Table 3 about here

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## 4. Discussion

In this study, we examined the link between ketamine expectancy and different ketamine-using experience in a sample of 1012 regular tobacco and alcohol users aged 18 to 40 in Taipei metropolitan area. Our results reveal that both positive and negative expectancy of ketamine are associated with ketamine-using experience, though in opposite directions. In addition, combinations of positive-negative expectancy lead to a better differential association with the intensity of ketamine use, and yielded useful information for the intervention and prevention of ketamine use.

Findings from the present study indicate that the group of illegal drug naïve had higher negative expectancy and lower positive than the groups of ketamine use only and ketamine use with other drugs did. Compared to the general population, regular tobacco and alcohol users would be more likely to contact with ketamine users. Since illegal drug-naïve people might obtain their knowledge about ketamine mostly from media or peer's report on the cognitive impairment or other physical problems from ketamine users, their endorsement of negative expectancy might increase and that of positive expectancy might decrease (Schafer & Brown, 1991). These findings suggest that negative expectancy might present a protective effect of initial ketamine use. We might reduce the probability of initial ketamine use among regular tobacco and alcohol users by increasing their negative expectancy of ketamine.

One feature of our study is that we compared three groups of people with different ketamine-using experience, i.e. from non-use to single drug use, and finally to poly-drug use. We found an increasing trend of positive expectancy and a decreasing trend of negative expectancy with the increasing magnitude of ketamine use. Our results were consistent with previous studies showing that positive expectancy might increase and negative expectancy might decrease once people begin to use the drug or progress to more severe use (Schafer & Brown, 1991; Engels & ter Bogt, 2004; Hayaki et al., 2010). It is noteworthy that negative expectancy still plays a protective role in further severe drug use for ketamine use only. It is possible that since the main expectations of ketamine use were reported for entertainment by our study subjects, once the group of ketamine use only observed the harm of using ketamine with other drugs, the negative expectancy might be increased and decided not to continue such use. This finding suggests that we might be aimed at ketamine use only to enhance the strength of negative expectancy. In this way, the probability of using other drugs might be reduced among ketamine use only.

After dichotomizing positive and negative expectancy into high versus low subgroups, we found that the highest proportion of combinations of positive-negative expectancies for three different ketamine-using experiences, respectively, were all low-negative expectancy, but ketamine use only and ketamine use with other drugs

were high-positive expectancy, and illegal drug naïve was low-positive expectancy.

After adjusting other covariates, high-positive/low-negative expectancy has higher risk on ketamine use. Although not reaching significance, high-positive/high-negative expectancy was also revealed the higher risk on ketamine use. These results showed that positive and negative expectancies might mutually affect the decision, and suggested that considering one dimension of expectancies might not demonstrate the decision of ketamine use appropriately.

Since our study design was cross-sectional study, we could not clarify the causal relationship between ketamine expectancy and ketamine use. In order to explore the applications for ketamine expectancy for ketamine use, we further investigated the association between drug-using behaviors and combinations of positive-negative expectancy among ketamine users (i.e. ketamine use only and ketamine use with other drugs). Despite not reaching significance, people with high-negative expectancy (i.e. high-positive/high-negative expectancy, low-positive/high-negative expectancy) tended to have social function impairment. Except for high-positive/low-negative expectancy, people with other combinations of positive-negative expectancy were more likely to seek help for illegal drug using. These results suggested that decreasing positive expectancy or increasing negative expectancy might probably influence the decision of maintaining ketamine use among ketamine users.

This study has some limitations. First, the ketamine expectancy questionnaires were derived from ACEQ, and not particularly designed for ketamine. Since different substance might induce different anticipations and physical effects, previous studies suggested that each substance should develop its own expectancy questionnaire to test expectancy theory (Schafer & Brown, 1991). However, since no studies have constructed the expectancy of ketamine yet, we used ACEQ as a substitution. Therefore, our ketamine expectancy questionnaire might not appropriately represent the true effects for ketamine use, but described the common effects for substance. Future work should collect the information about drug effects of ketamine from users and construct ketamine expectancy questionnaires. Second, all data were self-reported. Although our data were collected by ACASI, the reliability of data for sensitive issue, such as illegal drug use, might still be a question. Third, our study was cross-sectional study design. Because of the reciprocal association between ketamine expectancies and ketamine use, we cannot clarify the real causality between the expectancy and ketamine-using behavior.

In conclusion, this study helped shed light on the relationship between different ketamine-using experience and ketamine expectancy, and provided additional information for designing possible strategies to prevent from ketamine use or problem use, and combinations of positive-negative expectancy played an important role in

understanding ketamine-using behavior.





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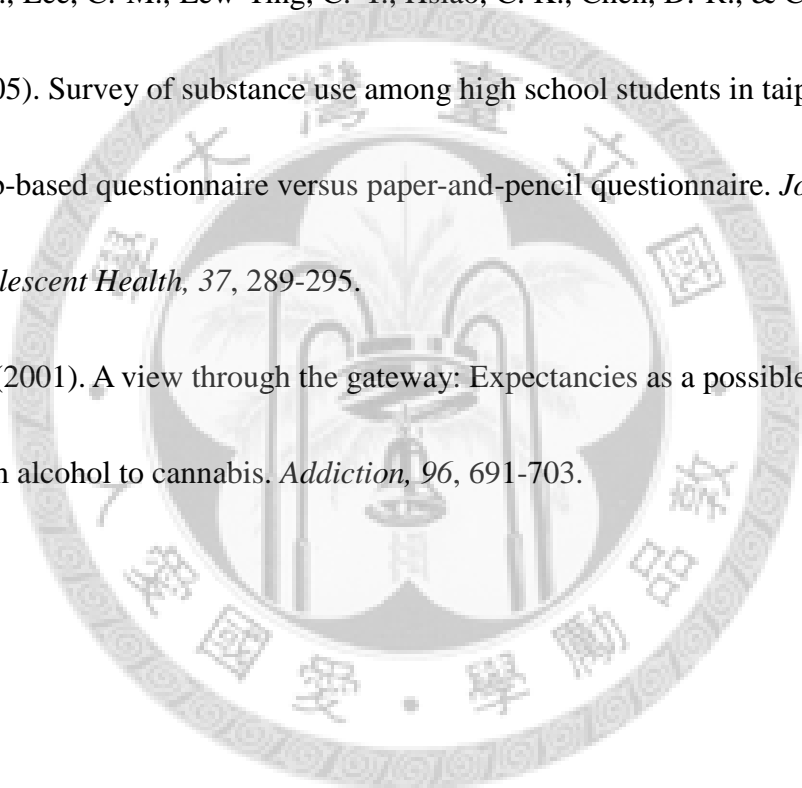
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## Tables

Table 1. Demographics, ketamine-using history and drug-related behavior by ketamine-using experience among regular tobacco and alcohol users aged 18 - 40 from 2007 to 2010 in Taipei metropolitan area (N = 1012)

Variables	Total N = 1012	Subgroups			p-value
		Illegal drug naïve N = 845	Ketamine use only N = 30	Ketamine use with other drugs N = 137	
<b>Demographics</b>					
Male, n (%)	618 (61.1)	506 (60.0)	20 (66.7)	92 (67.2)	0.2
Education ≥ 15 years, n (%)	377 (37.3)	331 (39.2)	7 (23.3)	39 (28.5)	0.02
Unemployment, n (%)	260 (25.7)	215 (25.4)	8 (26.7)	37 (27.0)	0.9
Family history of substance use, n (%)	620 (61.6)	502 (59.4)	24 (80.0)	94 (68.6)	0.01
Age, mean (SD)	27.6 (7.9)	28.0 (8.3)	21.8 (3.6)	26.0 (5.4)	< .0001
<b>Ketamine-using history</b>					
Age of first use, mean (SD)			18.7 (3.5)	20.2 (5.2)	0.04
Duration of use, mean (SD)			3.1 (1.9)	5.7 (3.6)	< .0001
Lifetime use ≥ 5 times, n (%)			8 (26.7)	85 (62.0)	0.004
Recent use ≤ 6 months, n (%)			10 (33.3)	51 (37.2)	0.7
Frequency ≥ 1days/month, n (%)			11 (36.7)	60 (43.8)	0.4

Table 2. Ketamine expectancy by ketamine-using experience among regular tobacco and alcohol users aged 18 - 40 from 2007 to 2010 in Taipei metropolitan area (N = 1012)

Variables	Illegal drug naïve	Ketamine use only		Ketamine use with other drugs		p for trend
	N=845	N=30		N=137		
	Mean (SD)	Mean (SD)	aOR (95%CI) <sup>a,b</sup>	Mean (SD)	aOR (95%CI) <sup>a,b</sup>	
Positive expectancy of ketamine	1.4 (1.5)	2.1 (1.6) <sup>**</sup>	1.51 (1.2-1.9)	2.3 (1.6) <sup>***</sup>	1.68 (1.5-1.9)	<.0001
Negative expectancy of ketamine	4.2 (2.2)	3.5 (2.2)	0.80 (0.7-1.0)	3.2 (1.7) <sup>***</sup>	0.70 (0.6-0.8)	<.0001
	n (%)	n (%)	aOR (95%CI) <sup>a,b</sup>	n (%)	aOR (95%CI) <sup>a,b</sup>	
Low-Positive/High-Negative <sup>c</sup>	187 (22.1)	4 (13.3)	1.00	2 (1.5)	1.00	
Low-Positive/Low-Negative <sup>c</sup>	315 (37.3)	7 (23.3)	0.94 (0.3-3.3)	40 (29.2)	12.0 (2.9-50.4)	
High-Positive/High-Negative <sup>c</sup>	152 (18.0)	6 (20.0)	1.79 (0.5-6.7)	11 (8.0)	6.98 (1.5-32.1)	
High-Positive/Low-Negative <sup>c</sup>	191 (22.6)	13 (43.3) <sup>*</sup>	3.28 (1.0-10.5)	84 (61.3) <sup>***</sup>	41.21 (9.97-170.28)	

<sup>a</sup>The adjusted odds ratio (aOR), with an adjustment for all of demographic variables by a multinomial logistic regression analysis.

<sup>b</sup>Using illegal drug naïve as reference group.

<sup>c</sup>The cutoff-points were the median of positive expectancy and negative expectancy among illegal drug naïve, respectively (High-Positive  $\geq 2$ , High-Negative = 6).

\* p < .05, \*\* p < .01, \*\*\* p < .0001

Table 3. Combinations of positive-negative expectancy by drug-related behavior among ketamine users aged 18 - 40 from 2007 to 2010 in Taipei metropolitan area (N = 167)

	Total (N = 167)	Social function impairment (N = 24)		Seeking help (N = 39)	
	Mean (SD)	Mean (SD)	aOR (95% CI) <sup>a</sup>	Mean (SD)	aOR (95% CI) <sup>a</sup>
Demographics					
Age	25.2 (5.3)	27.7 (7.9)	1.06 (1.0-1.1)	26.9 (7.3)	1.06 (1.0-1.1)
	n (%)	n (%)	aOR (95% CI) <sup>a</sup>	n (%)	aOR (95% CI) <sup>a</sup>
Male	112 (67.1)	19 (79.2)	1.59 (0.5-4.8)	30 (76.9)	1.69 (.07-4.2)
Education ≥ 15 years	46 (27.5)	3 (12.5)	0.29 (0.1-1.1)	1 (2.6) <sup>***</sup>	0.05 (0.0-0.3)
Unemployment	45 (27.0)	7 (29.2)	1.26 (0.4-1.5)	9 (23.1)	0.93 (0.4-2.3)
Family history of substance use	118 (70.7)	13 (54.2)	0.41 (0.2-1.1)	26 (66.7)	0.73 (0.3-1.8)
Combination of expectancy					
High-Positive / Low-Negative <sup>b</sup>	78 (46.7)	15 (62.5)	1.00	22 (56.4)	1.00
High-Positive / High-Negative <sup>b</sup>	36 (21.6)	4 (16.7)	1.86 (0.5-6.9)	4 (10.3)	1.04 (0.3-3.9)
Low-Positive / Low-Negative <sup>b</sup>	43 (25.7)	4 (16.7)	0.67 (0.2-2.2)	10 (25.6)	1.18 (0.5-3.0)
Low-Positive / High-Negative <sup>b</sup>	10 (6.0)	1 (4.2)	1.54 (0.2-15.4)	3 (7.7)	5.17 (0.8-33.2)

<sup>a</sup>The adjusted odds ratio (aOR), with an adjustment for all of the demographic variables by logistic regression analysis.

<sup>b</sup>The cutoff-points were the median of positive expectancy and negative expectancy among illegal drug naïve, respectively (High-Positive ≥ 2, High-Negative = 6).

\* p < .05, \*\* p < .01, \*\*\* p < .0001

## Appendix

### Appendix I: Positive and negative subscales for ketamine expectancy

請您不論是否有使用過搖頭丸、k他命或大麻等藥物，勾選您心目中對這些物質的印象。		搖頭丸	K他命	大麻
Positive Q1.	使用之後能讓人更勇於面對他人。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Negative Q1.	使用之後容易讓人失控並發生意外。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Positive Q2.	使用之後能讓人更容易融入大家很 high 的氣氛中。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Negative Q2.	使用之後會讓人變得很不親切。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Positive Q3.	使用之後開車會開得更好。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Negative Q3.	使用的人會受到人們的指責。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Positive Q4.	使用之後能讓派對更好玩、更有趣。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Negative Q4.	使用之後會讓人很難了解事情。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Negative Q5.	使用之後會讓人更容易摔壞、破壞東西。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Positive Q5.	在假日使用會讓假期過得更愉快。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Negative Q6.	使用之後記憶力會變差，讓人容易忘東忘西。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否
Positive Q6.	使用之後會讓世界更美好。	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否	1 <input type="checkbox"/> 是 2 <input type="checkbox"/> 否



## Appendix II: Supplementary tables

Table A1. Subscales of positive and negative expectancy by ketamine-using experience among regular tobacco and alcohol users aged 18 - 40 from 2007 to 2010 in Taipei metropolitan area (N = 1012)

Ketamine expectancy	Total N = 1012	Subgroups			p-value
		Illegal drug naïve N = 845	Ketamine use only N = 30	Ketamine use with other drugs N = 137	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Positive					
Q1	0.1 (0.4)	0.1 (0.3)	0.3 (0.5)	0.3 (0.4)	< .0001
Q2	0.5 (0.5)	0.5 (0.5)	0.6 (0.5)	0.7 (0.5)	< .0001
Q3	0.0 (0.2)	0.0 (0.2)	0.1 (0.4)	0.0 (0.2)	
Q4	0.4 (0.5)	0.4 (0.5)	0.6 (0.5)	0.7 (0.5)	< .0001
Q5	0.2 (0.4)	0.2 (0.4)	0.3 (0.5)	0.4 (0.5)	< .0001
Q6	0.1 (0.4)	0.1 (0.3)	0.2 (0.4)	0.2 (0.4)	< .05
Negative					
Q1	0.7 (0.5)	0.7 (0.4)	0.5 (0.5)	0.5 (0.5)	< .0001
Q2	0.5 (0.5)	0.5 (0.5)	0.4 (0.5)	0.2 (0.4)	< .0001
Q3	0.7 (0.4)	0.7 (0.4)	0.6 (0.5)	0.7 (0.5)	
Q4	0.7 (0.5)	0.7 (0.5)	0.6 (0.5)	0.6 (0.5)	< .05
Q5	0.7 (0.5)	0.7 (0.5)	0.6 (0.5)	0.4 (0.5)	< .0001
Q6	0.8 (0.4)	0.8 (0.4)	0.8 (0.4)	0.8 (0.4)	

Table A2. Ketamine-using experience by expectancy of three illegal drugs among regular tobacco and alcohol users aged 18 - 40 from 2007 to 2010 in Taipei metropolitan area (N = 1012)

	Positive expectancy				Negative expectancy			
	Ketamine	Ecstasy	Marijuana	p for ANOVA	Ketamine	Ecstasy	Marijuana	p for ANOVA
	Mean (SD)	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	Mean (SD)	
Illegal drug naïve (n = 845)	1.4 (1.5)	1.6 (1.6)	1.7 (1.6)	< .0001 <sup>a</sup>	4.2 (2.1)	4.1 (2.2)	4.4 (2.1)	0.03 <sup>b</sup>
Ketamine use only (n = 30)	2.1 (1.6)	1.9 (1.6)	1.9 (1.6)	0.8	3.5 (2.2)	3.7 (2.2)	4.1 (2.2)	0.5
Ketamine use with other drugs (n = 137)	2.3 (1.5)	2.6 (1.4)	2.7 (1.6)	0.08	3.2 (1.7)	3.1 (1.8)	3.0 (1.9)	0.8
p for trend	< .0001	< .0001	< .0001		< .0001	< .0001	< .0001	

<sup>a</sup>Bonferroni procedure for multiple tests: ketamine expectancy-ecstasy expectancy, ketamine expectancy-marijuana expectancy

<sup>b</sup>Bonferroni procedure for multiple tests: ecstasy expectancy-marijuana expectancy

## Appendix III: Supplementary figures

Figure A1. Pie chart for lifetime use experience of ketamine among regular tobacco and alcohol users aged 18 - 40 from 2007 to 2010 in Taipei metropolitan area (n = 1012)

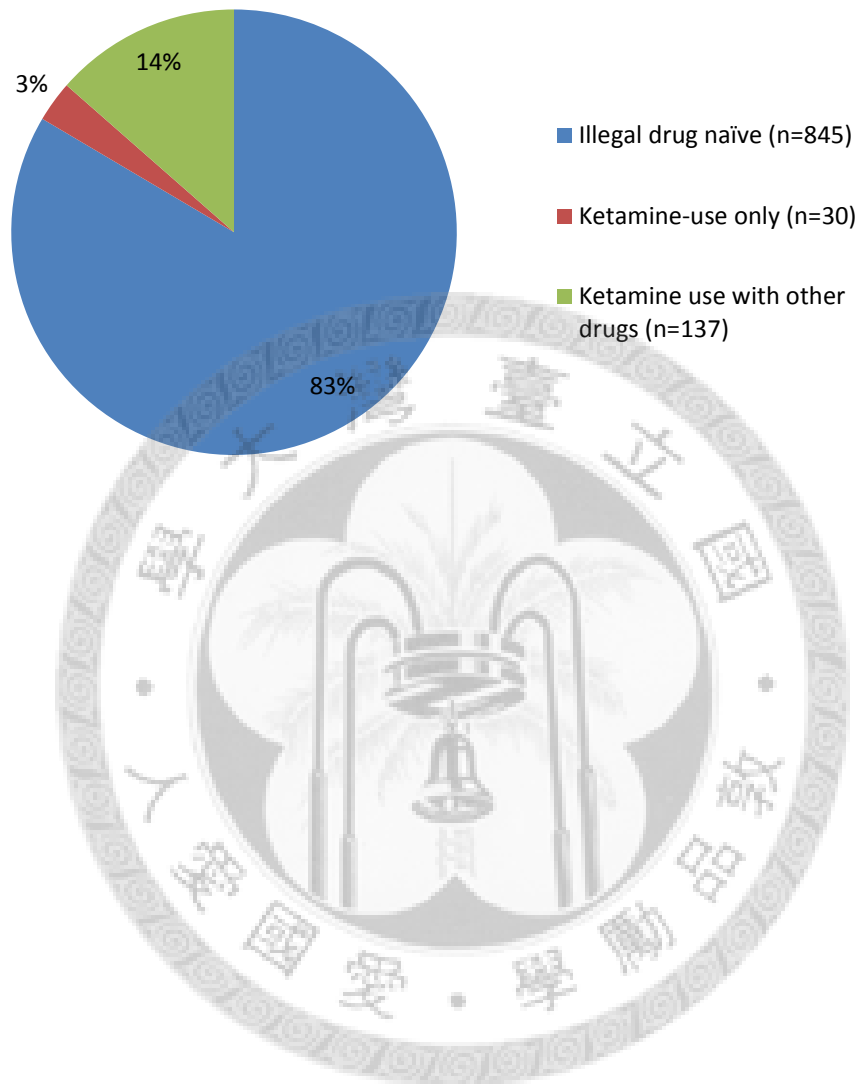


Figure A2. Lifetime illegal drug-using experience for the group of ketamine use with other drugs aged 18 - 40 from 2007 to 2010 in Taipei metropolitan area (n = 137)

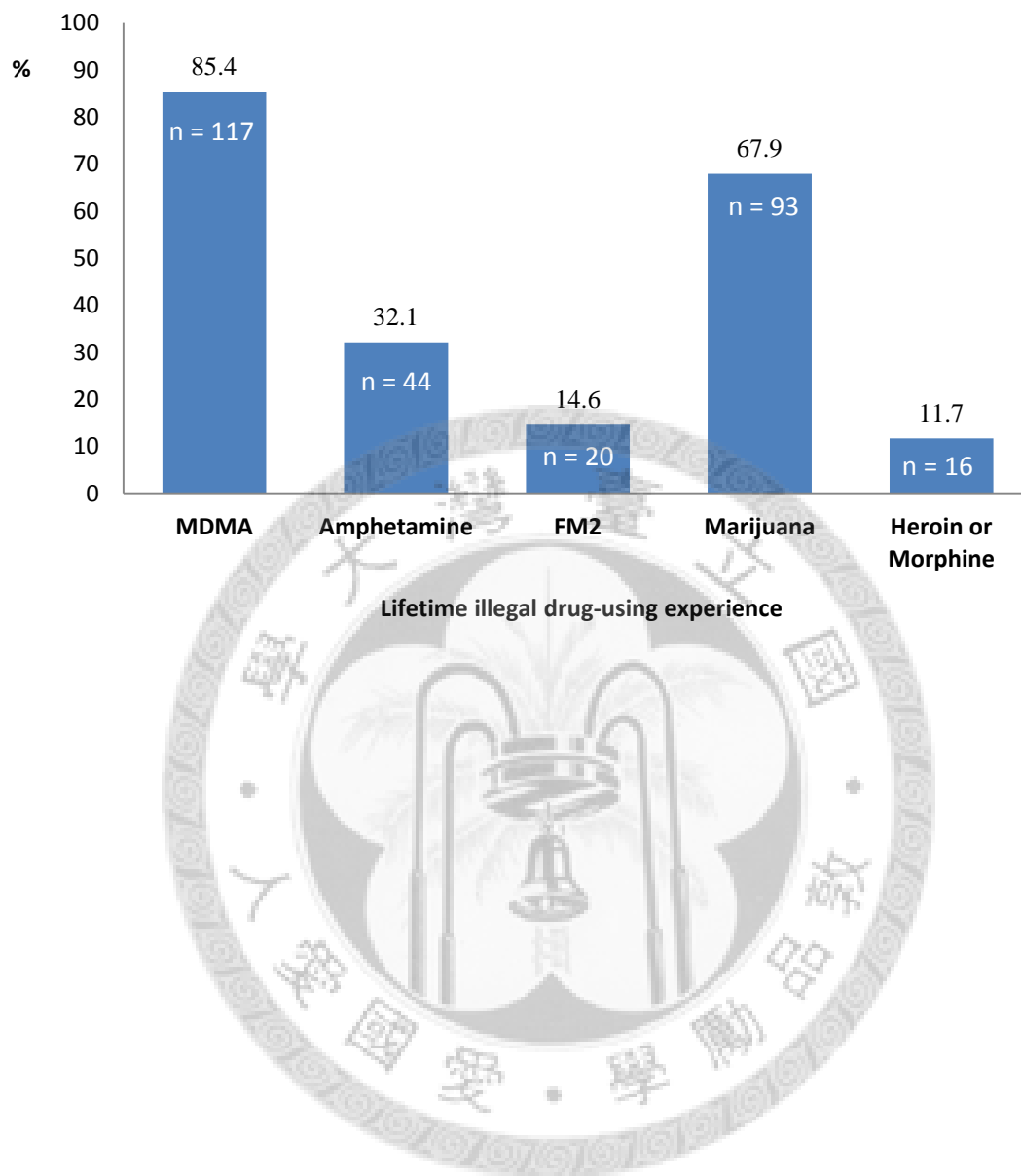


Figure A3. Types of lifetime illegal drug-using experience of the group of ketamine use with other drugs aged 18 - 40 from 2007 to 2010 in Taipei metropolitan area (n = 137). (K + n, representing that ketamine use with n more drugs)

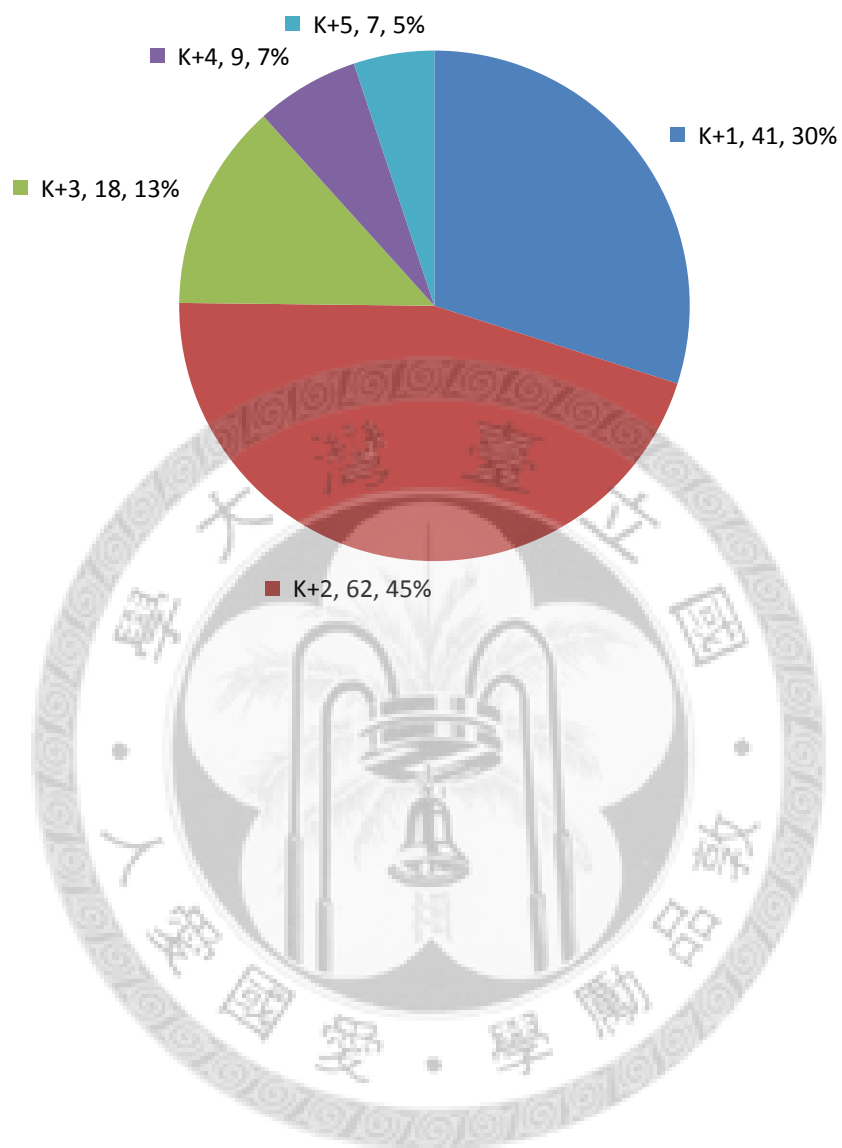


Figure A4. Ketamine expectancies by lifetime use experience of ketamine among regular tobacco and alcohol users aged 18 - 40 from 2007 to 2010 in Taipei metropolitan area (n = 1012)

