

How does Ketamine use affect long term mental health and drug use outcomes?

A propensity score matching analysis from the
Electronic Music Scene Survey.

Dr Meryem Grabski
Research Associate
Clinical Psychopharmacology Unit
University College London

ALAMA Electronic Music Scene Survey

- Part of ALAMA Nightlife Consortium (BE, NL, SV, IT, UK)
- Survey: online, international, longitudinal
- Baseline survey: May to November 2017
- Follow-up: May to November 2018
- Inclusion criteria: age 18-34, attended ≥ 6 electronic dance music events in past 12 months, resident in one of participating countries



Electronic Music Scene Survey (EMSS)

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**Want to know more about the ALAMA
nightlife consortium?**

**Come to our structured session
tomorrow! 15.00 @ Networking Zone 1**
“Insight into the dynamics of substance
use in nightlife settings”

ALAMA Electronic Music Scene Survey

- EMSS Domains:
 - Demographics
 - Nightlife Engagement
 - Drug use
 - Risks and Experiences
 - Harm Reduction

- Completers Baseline Survey: N=8045

- Completers Follow-Up Survey: N=2900



Background

- Medical use of Ketamine
 - Esketamine has been approved by the FDA as a drug for treatment resistant depression in April 2019
 - Decision for introduction as mental health treatment in EU pending
 - Scale of control?



Background

- Recreational ketamine use on the rise
 - Ketamine use doubled among adults aged 16 to 59 in the UK ¹
 - What are the long term effects of recreational use?

Period	Adults 16 - 59	Adults 16 - 24
2012/13	0.4	0.8
2013/14	0.6	1.8
2014/15	0.5	1.6
2015/16	0.3	1.0
2016/17	0.4	1.2
2017/18	0.8	3.1
2018/19	0.8	2.9

¹ Great Britain. Home office (2019). Drug Misuse: Findings from the 2018/19 Crime Survey for England and Wales.

Ketamine vs. Non Ketamine Users

- Mental health outcomes (Depression/ Anxiety)
 - Do changes in ketamine use affect mental health outcomes?
 - Are high frequency users more likely to experience negative mental health outcomes than less frequent users? (Morgan et al., 2010)

Ketamine vs. Non Ketamine Users

- Substance use outcomes (AUDIT, DUDIT)
 - Are changes in ketamine use associated with changes in problematic substance use outcomes?
 - Is frequency of ketamine use related to changes in problematic substance use outcomes?



Ketamine vs. Non Ketamine Users

Protocol preregistered at:
<https://osf.io/zecy3/>

- Substance use outcomes (AUDIT, DUDIT)
 - Are changes in ketamine use associated with changes in problematic substance use outcomes?
 - Is frequency of ketamine use related to changes in problematic substance use outcomes?

Ketamine vs. Non Ketamine Users Baseline

	Ketamine Users (N = 744)	Non Ketamine Users (N = 2153)
Age	23.95 (23.65 to 24.25)	23.79 (23.60 to 23.99)
Gender	32% f	34% f
No. Drugs Lifetime	11.28 (11.05 to 11.50)	5.03 (4.88 to 5.17)
No. Drugs 12 Mos.	9.22 (9.04 to 9.23)	3.58 (3.48 to 3.68)
No. Nightlife Events 12 Mos.	21.73 (20.39 to 23.07)	16.77 (16.12 to 17.42)
Cannabis 12 Mos.	87 %	53 %
Ecstasy 12 Mos.	96 %	39 %
AUDIT	5.96 (5.80 to 6.11), N = 738	5.24 (5.15 to 5.34), N = 2080
DUDIT	10.38 (9.99 to 10.77), N = 744	6.35 (6.11 to 6.60), N = 1450

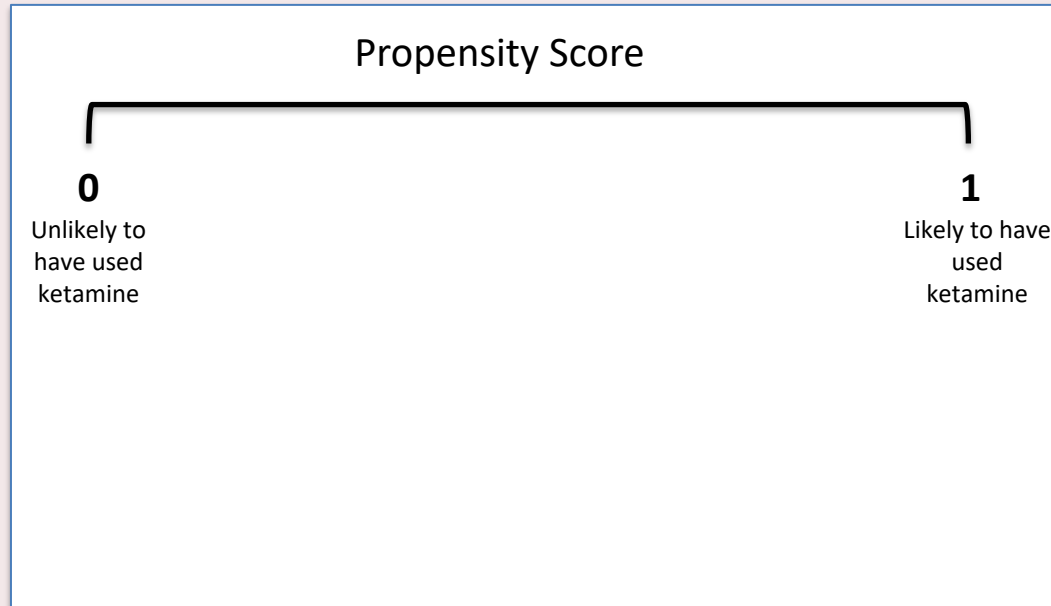
Propensity Score Matching

- Baseline covariates for matching:
 - Age
 - Gender
 - Country
 - Cannabis Frequency 12 months
 - Ecstasy Frequency 12 months
 - Cocaine Frequency 12 months
 - Alcohol Frequency 12 months
 - Tobacco Frequency 12 months
 - No. Nightlife Events
 - Wellbeing (WHO-5)
 - Problematic Substance Use (DUDIT)
 - Problematic Alcohol Use (AUDIT)

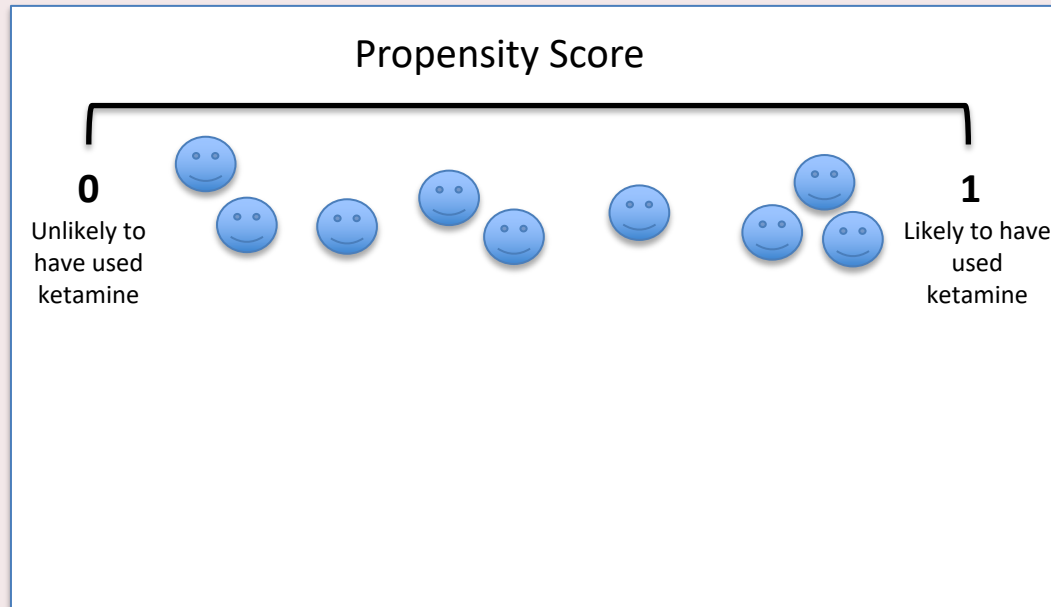
- Logit model to estimate propensity scores:

```
PropensityScore <-glm(Ket_12m ~ Age + Gender + Country + Can_Freq12m + Ecs_Freq12m + Coc_Freq12m +  
  Alc_Freq12m + Tob_Freq12m + Events12m + WHO5_Comp + DUDIT_Comp + AUDITC_Comp, family =  
  binomial (), data = completeKETA)
```

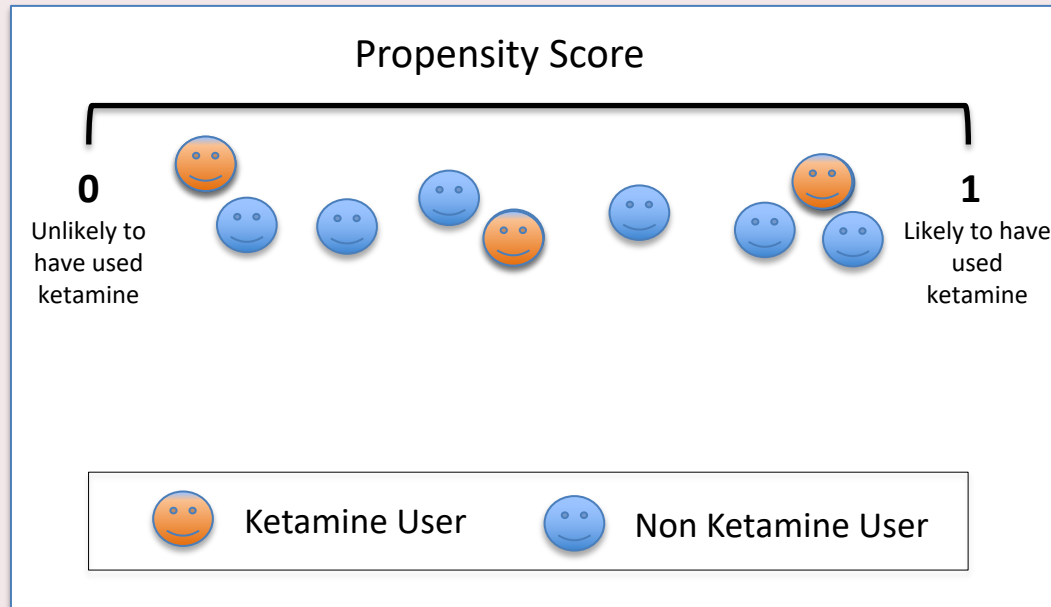
Propensity Score Matching



Propensity Score Matching



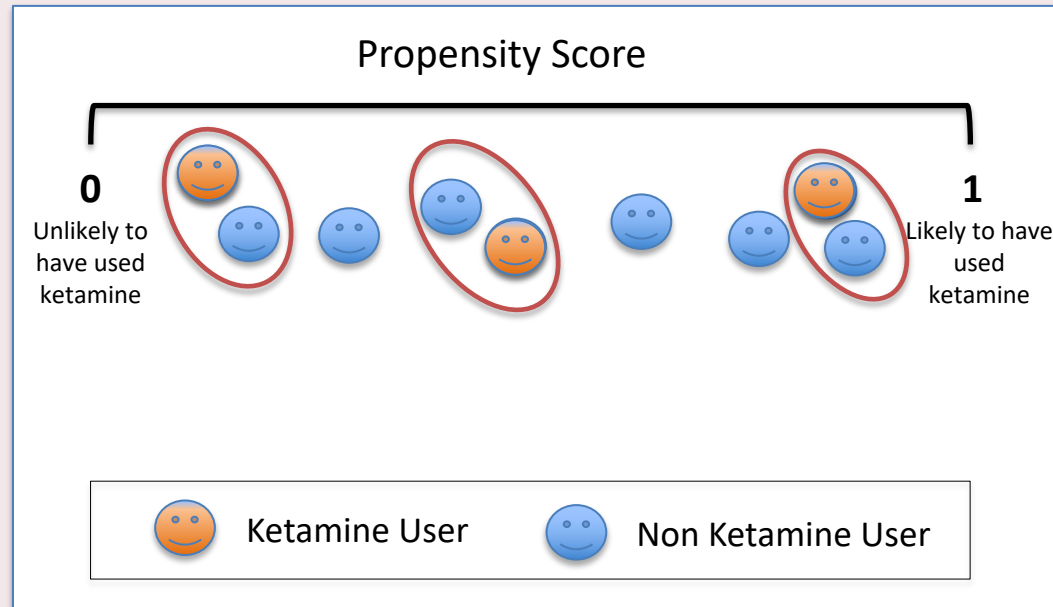
Propensity Score Matching



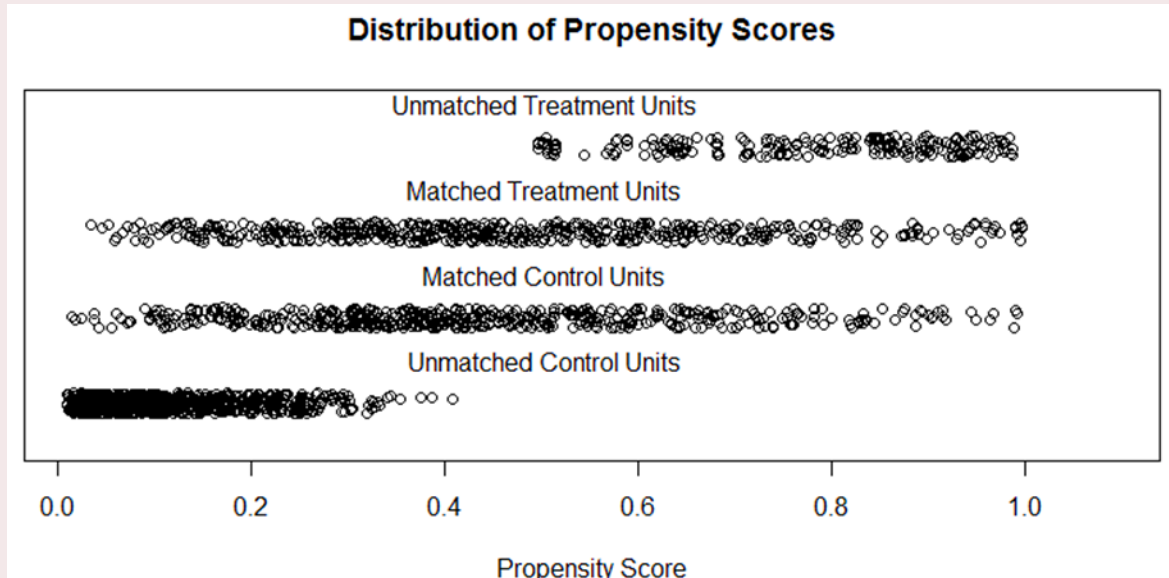
Propensity Score Matching

Type= nearest
neighbour
matching

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Analysis – Propensity Score Matching



	Control	Treated
All	1439	738
Matched	514	514
Unmatched	925	224

Ketamine vs. Non Ketamine Users Post Matching

	Ketamine Users (N = 514)	Non Ketamine Users (N = 514)
Age	24.13 (4.91)	24.23 (4.41)
Gender	34% f	34% f
No. Drugs Lifetime	11.06 (3.01)	8.03 (3.03)
No. Drugs 12 Mos.	8.91 (2.46)	6.06 (2.09)
No. Nightlife Events 12 Mos.	20.04 (19.03)	18.75 (17.42)
Cannabis 12 Mos.	86 %	83 %
Ecstasy 12 Mos.	95 %	89 %
AUDIT	5.72 (2.21)	5.69 (2.11)
DUDIT	9.19 (4.94)	8.84 (5.30)

Ketamine vs. Non Ketamine Users Post Matching

	Ketamine Users (N = 514)		Non Ketamine Users (N = 514)	
	post matching	pre matching	post matching	pre matching
Age	24.13	23.95	24.23	23.79
Gender	34% f	32 % f	34% f	34 % f
No. Drugs Lifetime	11.06	11.28	8.03	5.03
No. Drugs 12 Mos.	8.91	9.22	6.06	3.58
No. Nightlife Events 12 Mos.	20.04	21.73	18.75	16.77
Cannabis 12 Mos.	86 %	87 %	83 %	53 %
Ecstasy 12 Mos.	95 %	96 %	89 %	39 %
AUDIT	5.72	5.96	5.69	5.24
DUDIT	9.19	10.38	8.84	6.35

Results – Mental Health Outcomes

- Association of ketamine use & depression (PHQ-2)

	RC	SE	p
Treatment	0.05	0.08	0.53

Results – Mental Health Outcomes

- Association of changes in ketamine use & depression (PHQ-2)

	RC	SE	p
Treatment	0.08	0.06	0.35
Ket_change	0.02	0.04	0.49
Can_change	-0.02	0.03	0.48
Ecs_change	0.03	0.04	0.43
Coc_change	0.01	0.03	0.64
Alc_change	0.05	0.04	0.16

Results – Mental Health Outcomes

- Association of changes in and frequency of ketamine use & depression (PHQ-2)

	RC	SE	p
Treatment	-0.06	0.09	0.53
Ket_change	-0.01	0.03	-0.17
Can_change	-0.01	-0.44	0.66
Ecs_change	0.04	0.04	0.37
Coc_change	-0.03	0.04	0.05
Alc_change	0.03	0.04	0.41
Ket_high_freq	0.73	0.39	0.06
Ket_med_freq	0.16	0.16	0.28

Results – Mental Health Outcomes

- Association of ketamine use & anxiety (GAD-2)

	RC	SE	p
Treatment	-0.05	0.08	0.51

Results – Mental Health Outcomes

- Association of changes in ketamine use & anxiety (GAD-2)

	RC	SE	p
Treatment	-0.05	0.08	0.58
Ket_change	0.01	0.04	0.86
Can_change	-0.01	0.03	0.56
Ecs_change	0.01	0.04	0.88
Coc_change	-0.05	0.04	0.19
Alc_change	0.02	0.48	0.62

Results – Mental Health Outcomes

- Association of changes in and frequency of ketamine use & anxiety (GAD-2)

	RC	SE	p
Treatment	-0.12	0.09	0.20
Ket_change	0.02	0.04	0.52
Can_change	-0.03	0.03	0.42
Ecs_change	0.01	0.04	0.81
Coc_change	-0.05	0.04	0.21
Alc_change	0.02	0.04	0.67
Ket_high_freq	1.41	0.40	<0.001
Ket_med_freq	0.26	0.15	0.09

Results – Alcohol Use Outcomes

- Association of ketamine use & changes in problematic alcohol use (AUDIT)

	RC	SE	p
Treatment	-0.04	0.12	0.69

Results – Alcohol Use Outcomes

- Association changes in ketamine use & changes in problematic alcohol use (AUDIT)

	RC	SE	p
Treatment	0.07	0.12	0.56
Ket_change	0.16	0.05	<0.01
Can_change	-0.01	0.04	0.93
Ecs_change	-0.01	0.06	0.09
Coc_change	0.09	0.05	0.08
Alc_change	0.75	0.06	<0.0001

Results – Alcohol Use Outcomes

- Association changes in and frequency of ketamine use & changes in problematic alcohol use (AUDIT)

	RC	SE	p
Treatment	0.07	0.12	0.55
Ket_change	0.16	0.05	<0.01
Can_change	-0.01	0.04	0.95
Ecs_change	-0.01	0.06	0.92
Coc_change	0.09	0.56	0.08
Alc_change	0.76	0.05	<0.0001
Ket_high_freq	-0.25	0.54	0.64
Ket_med_freq	-0.01	0.22	0.95

Results – Substance Use Outcomes

- Association ketamine use & changes in problematic drug use (DUDIT)

	RC	SE	p
Treatment	0.41	0.31	0.19

Results – Substance Use Outcomes

- Association changes in ketamine use & changes in problematic drug use (DUDIT)

	RC	SE	p
Treatment	0.66	0.32	<0.02
Ket_change	0.71	0.14	<0.001
Can_change	0.66	0.11	<0.001
Ecs_change	0.91	0.16	<0.001
Coc_change	0.85	0.14	<0.001
Alc_change	0.06	0.42	0.67

Results – Substance Use Outcomes

- Association changes in and frequency of ketamine use & changes in problematic drug use (DUDIT)

	RC	SE	p
Treatment	0.49	0.31	0.11
Ket_change	0.74	0.15	<0.001
Can_change	0.66	0.11	<0.001
Ecs_change	0.92	0.16	<0.001
Coc_change	0.85	0.15	<0.001
Alc_change	0.06	0.15	0.68
Ket_high_freq	1.11	1.46	0.45
Ket_med_freq	0.46	0.58	0.43

General Conclusions

- increased/frequent use of ketamine is associated with increased risks for poor mental health and problematic alcohol and substance use
- ketamine use might be associated with mental health and problematic alcohol and substance use over and above general polysubstance use/ lifestyle
- we need to distinguish and communicate the effects of ketamine in a clinical versus a recreational setting carefully (effects might be reversed)



UCL

Thanks for listening!

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- Jochen Schrooten

Email: m.grabski@ucl.ac.uk

Propensity Score Matching

Propensity Score Matching

Propensity Scores versus Regression

- Not much difference statistically – advantage of PSM – less assumptions about properties of data (linearity etc)
- More straightforward when pre-determining analysis (eg. pre-registering)

Propensity Score Matching

The propensity score is the probability of treatment assignment conditional on observed baseline characteristics. The propensity score allows one to design and analyse an observational study so that a treatment group is well matched to a control group.

Conditional on the propensity score, the distribution of observed baseline covariates will be similar between treated and untreated subjects.

Method is used to find a comparison group of non-treated subjects with similar pre-intervention characteristics as the treatment group.