**WEDNESDAY 7 October**

**Workshop 1:** Full Day: An introduction to cannabis  
**Venue:** Room TBA  
**Chair:** Jan Copeland

9.00-9.15  **Jan Copeland:** Introduction

9.15-9.35  **Ken Pidd:** Changes in cannabis use and related beliefs in Australia from 2004-2013

9.35-9.55  **Victoria Kostadinov:** Bongs and baby boomers: Prevalence and predictors of cannabis use among older Australians

9.55-10.15  **Kristina Phillips:** Post-legalization marijuana use among university students in Colorado, USA

10.15-10.45  **Peter Gates:** Cannabis-related harms

10.45-11.15  Morning tea

11.15-12.15  **Marilyn Huestis:** Cannabis effects, metabolism and elimination

12.15-12.45  **Jan Copeland:** Interventions

12.45-1.30  Lunch

1.30-5.00  **Etty Matalon:** 3 ‘Brief’ interventions for cannabis use disorder within a clinical setting

3.00-3.30  Afternoon tea

**Symposium 1:**  Cannabis: what’s the bother?  
**Venue:** Room TBA  
**Chair and Discussant:** Dr Edward Ogden  
9.15-12.45 with morning tea

9.15  **Introduction:** Edward Ogden

9.45  **TBC:** Marijuana and Madness

10.15  **A/Professor Yvonne Bonomo:** Cannabis and the adolescent brain

10.45  Morning tea

11.15  **Dr Jon Cook:** Medical marijuana, are there benefits?
11.45 Professor Con Stough: Effects on human performance

12.15 Dr Martyn Lloyd Jones: Does treatment make any difference?

**Symposium 2:** Cannabis Withdrawal
**Venue:** Room TBA
**Chair:** Jan Copeland
**1.30-5.00 with afternoon tea**

1.30 Jan Copeland: Overview of Cannabis Withdrawal

2.00 Bernadette Rogerson: Development of a culturally sensitive pictorial Cannabis Withdrawal Scale aligned with DSM-5 in a low literacy Australian Indigenous population

2.30 David Allsop: Cannabinoid Replacement Therapy (CRT) for the treatment of cannabis withdrawal and prevention of relapse to cannabis use

3.00 Afternoon tea

3.30 David Allsop: A randomized controlled trial of mirtazapine for outpatient cannabis withdrawal

4.00 Nick Lintzeris: A randomized controlled trial of daily aerobic exercise for inpatient cannabis withdrawal

4.30 Izabella Pokorski: A randomized controlled trial of daily aerobic exercise for inpatient cannabis withdrawal – Cannabidiol (CBD) for the management of cannabis withdrawal: a phase II proof of concept study

**THURSDAY 8 OCTOBER**

8.30 Welcome: NCPIC Chair (Hon) John Della Bosca
Indigenous Welcome to Country
Opening by Minister of Health

9.00 Plenary Session 1
**Venue:** Room TBA
**Chair:** Jan Copeland
**National Keynote Speaker:** Yvonne Cadet-James

Session 2: Current cannabis challenges
**Venue:** Room TBA
**Chair:** Jan Copeland
**Datablitz Session**
Natasha Nair
“Pure Rush”: Development of a serious game to educate young people about cannabis and illicit drugs
Shimpei Watanabe
*Metabolic studies of synthetic cannabinoids PB-22 and 5F-PB-22 by Cunninghamella elegans*

Alexandra Gannoni
*Strategies to enhance the effective dissemination of cannabis-related information to the criminal justice sector*

10.15 Morning tea with focus on posters

10.45 **Plenary Session 3**
*Venue:* Room TBA
*Chair:*

10.45 **International Keynote Speaker:** Marilyn Huestis
*Marijuana: from the street to the clinic*

11.25 **International Keynote Speaker:** Jose Crippa
*Translational research of cannabidiol (CBD) in neuropsychiatry*

11.55 **International Keynote Speaker:** Kevin Sabet
*Medicinal marijuana in the US*

12.45 Lunch

1.30 **Concurrent Sessions 4 – 5**

**Session 4:** Aboriginal and Torres Strait Islander communities
*Venue:* Room TBA
*Chair:* Alan Clough

**Session 5:** Cannabis Interventions
*Venue:* Room TBA
*Chair:*

1.30 Lesley Boyd: *Early Intervention for Cannabis related offences – providing treatment options rather than court* (1)

1.50 Catherine Milburn: *Going online to reach people seeking help: early PotHelp progress* (10)

2.10 Lisa Gibson: *Pilot testing the first evidenced-based smartphone app for the self-management of cannabis use*

2.30 Izabella Pokorski: *Very Brief Interventions for Cannabis Use*

2.50 Discussion

3.00 Afternoon tea

3.30-5.00 **Session 6:** Cannabinoids and driving
*Venue:* Room TBA
*Chair:*

3.30 Catherine Milburn
3.50  
Peter Gates  
*Prevalence of driving under the influence of cannabis in Australia*

4.00  
Olaf Drummer  
*Cannabis and Driving*

4.30  
Marilyn Huestis  
*Effects of Cannabis With and Without Low Dose Alcohol on Driving*

6.30 – 9.30 Welcome Reception

**FRIDAY 9 OCTOBER**

8.30  
Registration

9.00-11.00  
**Plenary Session 7**  
Venue:  
Chair: Michael Farrell

9.00  
National Keynote Speaker: Nadia Solowij  
*Studies of acute cannabinoid administration in humans: what’s the story with THC versus CBD?*

9.40  
National Keynote Speaker: Murat Yucel  
*Repairing and preventing cannabis related brain harms: a dream or reality?*

10.20  
National Keynote Speaker: Matthew Large  
*Cannabis; private, clinical, scientific & public perspectives*

11.00  
Morning tea

11.30-1.00  
**Concurrent Sessions 8 – 9**  
**Session 8: Cannabis and brain function**  
Venue: Room TBA  
Chair:

11.30 Valentina Lorenzetti:  
*Cannabis use disorders and neuroanatomical alterations: Where is the evidence?*

11.50 Valentina Lorenzetti:  
*Abnormal brain function in adolescent cannabis users: A systematic review of the evidence*

12.10 Samantha Broyd:  
*Acute effects of THC and CBD alone and in combination on default-mode connectivity: a functional resting-state MRI study*

12.30 Lisa-Marie Greenwood:  
*Cannabidiol attenuates the effect of Δ9-tetrahydrocannabinol on EEG brain oscillations during rest*

**Session 9: Cannabis prevention**  
Venue: Room TBA  
Chair:

11.30 Delyse Hutchinson:  
*Adolescent substance use and educational attainment: An integrative data analysis comparing cannabis and alcohol from three Australasian cohorts*

11.50 Kirsty Scholes-Balog:  
*Developmental trajectories of cannabis use among Australian adolescents: childhood predictors and young adult outcomes*

12.10 Katrina Champion:  
*Internet-based prevention for alcohol and cannabis use: 12-month outcomes from a cluster randomised controlled trial*

12.30 Amanda McDonald:  
*Survey of cannabis mass media campaigns*

12.50 Discussion
12.50 Discussion

1.00 Lunch CYCLES Viewing

2.00 Plenary Session 10
Venue: Room TBA
Chair:

2.00 National Keynote Speaker: David Penington

2.40 National Keynote Speaker: Bob Hopkins
My cannabis journey

3.20 International Keynote Speaker: Kevin Sabet
Cannabis 2.0 (US policy and commercialization)

4.40 Discussion and Closing

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ABSTRACTS

WORKSHOP 1
Introduction
Jan Copeland

In response to feedback from the 2012 conference calling for some introductory information about cannabis in general for those not specialising in research, treatment or policy in the area we are offering this overview of key issues with an emphasis on the “how to” of brief assessment and intervention delivery in the afternoon.

Changes in cannabis use and related beliefs in Australia from 2004 to 2013
Pidd, Ken1 and Roche, Ann1
1NCETA, Flinders University, Adelaide, SA, Australia

Background and aims: While the prevalence of cannabis use among Australians has declined over the past decade, population level research concerning associated changes in beliefs and attitudes is scarce. To address this, a study was conducted that examined changes in use and related beliefs among Australians from 2004 to 2013.


Results: Population levels of cannabis prevalence (past 12 month use) declined significantly (p<.001) from 11.3% in 2004 to 10.2% in 2013. The exception to this decline was for those age 50+ years where prevalence rose significantly (p<.001) from 1.5% to 3.6%. The proportion of Australians who approved of cannabis use declined significantly (p<.001) from 23.3% in 2004 to 9.4% in 2013. Proportions who believed cannabis was a ‘drug problem’ or the drug of most concern also declined significantly (p<.001). Declines in these beliefs/attitudes were consistent across age and gender groups. Overall, there were no significant population level changes in support for increased penalties for use or opposition to the legalisation of cannabis use. However there were some significant age and gender related changes in these beliefs.

Conclusions: While cannabis use is declining among Australians, those aged 50+ years are a growing risk group. Population level declines in use appear not to be associated with changes in beliefs that cannabis use is a ‘problem’ or community concern. Rather, declines in use appear associated with a decline in the acceptability (approval) of use. These findings have important implications for population level prevention strategies.

Correspondence: Ken Pidd; ken.pidd@flinders.edu.au

Bongs and baby boomers: Prevalence and predictors of cannabis use among older Australians
Roche, Ann1 & Kostadinov, Victoria3
1National Centre for Education and Training on Addiction, Flinders University, Adelaide, Australia

Background and aims. Recent demographic shifts have resulted in unprecedented changes in the number of older Australians, and concomitant changes in their patterns of alcohol and drug use, including cannabis. However, little research has been undertaken among older individuals. This paper examines patterns and predictors of cannabis use among older Australians over the past decade.

Method: Secondary analyses were conducted on nationally representative data from two time points (2004 and 2013, N=7127 and 7506, respectively), sourced from the National Drug Strategy
Household Survey. Descriptive analyses explored patterns of cannabis use among older Australians, and logistic regression explored predictors of use.

**Results:** Prevalence increased significantly (p<.001) from 1.5% to 3.6% among those aged 50+. The proportion of Australians aged 60+ years who used cannabis in the past 12 months increased significantly from 0.3% in 2004 to 1.2% in 2013 (p<.05). The largest increase was seen in those aged 60-69 (0.5% to 2.0%). Among those aged 60+ cannabis use was significantly less likely among those who were retired (OR: 0.6, 95% CI: 0.4-0.9) and married (OR: 0.3, 95% CI: 0.2-0.6), and significantly more likely among those who lived in rural areas (OR: 1.8, 95% CI: 1.2-2.6), drank alcohol at risky levels (OR: 2.5, 95% CI: 1.6-3.8), smoked (OR: 5.8, 95% CI: 3.8-8.9), and used other illicit drugs (OR: 3.6, 95% CI: 2.0-6.3).

**Conclusions:** In contrast to younger age groups (<40 years) where cannabis use has declined among 20-29 year olds, use among older Australians is significantly increasing. Despite this, the issue of cannabis use among older people has been largely overlooked. The policy and intervention implications of these trends will be addressed.

**Correspondence:** Victoria Kostadinov; victoria.kostadinov@flinders.edu.au

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**Post-legalization marijuana use among university students in Colorado, USA**

Phillips, Kristina1; Lalonde, Trent2 and Phillips, Michael1

1School of Psychological Sciences, University of Northern Colorado, Greeley, CO USA
2Applied Statistics and Research Methods, University of Northern Colorado, Greeley, CO USA

**Background and aims:** Marijuana is the most commonly abused illicit substance in the U.S., with high rates among young adults. Use of marijuana for medical purposes and the legalization of marijuana for recreational use in select U.S. states (Colorado and Washington) has been controversial, with concerns surrounding increased prevalence rates and harm. The current study aimed to assess the prevalence of marijuana use in college students in Colorado post-legalization, motives for using, and other trends in marijuana use.

**Method:** Participants included 300 college students recruited through introductory psychology courses who completed a series of self-report questionnaires and a marijuana urine screen. Participants were 61% female, predominantly Caucasian/White and Latino/Hispanic, and averaged 19.68 (SD = 1.32) years of age.

**Results:** Approximately 50% of participants reported use of marijuana within the last three months, over 40% used in the last month, and almost 30% tested positive on the urine screen. Twenty-two participants (7.3%) reported daily use of marijuana. Logistic and hurdle count regression models showed that male gender, Caucasian/White race, fraternity/sorority involvement, greater family income, and greater alcohol use were associated with increased number of days participants used marijuana in the last month. Among last month users, problem marijuana use was associated with greater coping, boredom, and alcohol motives.

**Conclusions:** Marijuana use was high in this sample of college students. Though it is unclear whether rates have increased since legalization, the data warrants increased monitoring and tailored interventions for students who use at higher rates (e.g., males, students who use marijuana to cope).

**Correspondence:** Kristina Phillips; kristina.phillips@unco.edu

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**Cannabis use: where’s the harm?**

Gates, Peter1

1National Cannabis Prevention and Information Centre, UNSW, Sydney, Australia

**Background and aims:** The extent of cannabis-related harms continues to be fervently debated. While popular opinion describes a drug relatively free of harm, this is not consistent with a growing evidence base of harms. This presentation will summarise the research literature on the harms
associated with cannabis use including dependence, psychoses, educational attainment, respiratory and cardiovascular risks, and motor vehicle accidents. The workshop will include learning and teaching resources on cannabis harms and links to more detailed information

Correspondence: Peter Gates; p.gates@unsw.edu.au

Cannabis effects, metabolism and elimination
Huestis, Marilyn

National Institute on Drug Abuse, USA

Understanding how cannabis exerts its effects on the body is key to comprehending how the drug hijacks the normal endogenous cannabinoid system in our brain and the important role this system plays in our survival and normal functioning. The onset, peak and duration of effects and drug absorption, distribution, metabolism and elimination will be explored, and the differences in these parameters between occasional and chronic frequent cannabis smokers demonstrated with controlled cannabinoid administration data. Helpful models for differentiating new cannabis use from residual drug excretion will be introduced.

Jan Copeland - Interventions

3 ‘Brief’ interventions for cannabis use disorder within a clinical setting
Matalon, Etty

National Cannabis Prevention and Intervention Centre, UNSW, Sydney, Australia

As the demand for cannabis interventions increases internationally, and specialist cannabis clinics are being made available in Europe and Australia, there is a need for evidence-based treatments and guidelines to inform best practice.

This workshop will outline three interventions. One intervention is a very brief intervention (VBI) that is 30 minutes in duration and delivered opportunistically. The other two interventions are more comprehensive – one for treatment seekers and the other for ambivalent clients. Both these interventions are based on the research findings of randomised-controlled trials conducted by NCPIC staff and draw upon cognitive-behavioural therapy and motivational interviewing.

The workshop is suitable for all clinicians and healthcare practitioners who work in a variety of settings and services where clients present with cannabis use and/or other disorders. Participants will be made familiar with the various aspects of these interventions including screening, assessment, feedback, education and more comprehensive treatments.

SYMPOSIUM 1
Marijuana and Madness
Chair and Discussant: Dr Edward Ogden

A/Professor Yvonne Bonomo: Cannabis and the adolescent brain

Dr Jon Cook: Medical marijuana, are there benefits?

Professor Con Stough: Effects on human performance

Dr Martyn Lloyd Jones: Does treatment make any difference?

SYMPOSIUM 2
Cannabis Withdrawal
Overview of Cannabis Withdrawal
Copeland, Jan
National Cannabis Prevention and Information Centre, UNSW, Sydney, Australia

This presentation will provide an overview of cannabis withdrawal and its measurement as an introduction to the workshop on cultural issues and intervention approaches.

Development of a culturally sensitive pictorial Cannabis Withdrawal Scale aligned with DSM-5 in a low literacy Australian Indigenous population
Rogerson, Bernadette; Copeland, Jan; Schnierer, Liana; Kidd, Garry; Watt, Kerrianne; Cadet-James, Yvonne and Clough, Alan R.

1College of Public Health, Medical and Veterinary Sciences, James Cook University, Cairns and Townsville, Australia
2National Cannabis Prevention & Information Centre, UNSW Medicine, Sydney, Australia
3College of Healthcare Sciences, James Cook University (Cairns Campus), Cairns, QLD, Australia
4School of Indigenous Australian Studies, James Cook University, Cairns and Townsville, Australia

Background and aims: Across the world issues of cannabis use and dependence are common health concerns, particularly for cohorts of typically heavy and prolonged users such as incarcerated and Indigenous populations. Upon cessation of cannabis, the withdrawal syndrome has been found to be clinically significant. In order to measure treatment effectiveness, a culturally sensitive and relevant measure of cannabis withdrawal is required. The Cannabis Withdrawal Scale (CWS) is the only validated measure of cannabis withdrawal syndrome, and has not been assessed for cultural appropriateness, in low literacy forensic populations. This study assessed withdrawal symptoms and severity in focus groups to ensure cultural relevance and suitability, to determine symptom alignment with the DSM-5 Cannabis Withdrawal criteria, and to investigate the addition of illustrations to represent each symptom for further testing upon ensuring face validity.

Method: A cultural expert reference group (N = 10) and nine focus groups (N = 58) comprised of incarcerated participants aged 18-56 years who identified as Indigenous in two high security prisons for men and women in north Queensland, Australia and an academic reference group (N = 9).

Results: A culturally sensitive pictorial scale aligned with DSM-5 Cannabis Withdrawal Syndrome criteria has been created.

Conclusions: This adaption of the validated CWS to ensure a culturally appropriate tool now uses language modification and the addition of a pictorial element for low literacy populations that will allow more accurate diagnosis and better treatment to prevent relapse and available for further validation and reliability testing for wider generalisation.

Correspondence: Bernadette Rogerson; bernadette.rogeron@my.jcu.edu.au

Cannabinoid Replacement Therapy (CRT) for the treatment of cannabis withdrawal and prevention of relapse to cannabis use
Allsop, David J.; Lintzeris, Nicholas; Copeland, Jan; Dunlop, Adrian and McGregor, Iain

Psychopharmacology Laboratory, School of Psychology, University of Sydney, Sydney, Australia
2Discipline of Addiction Medicine, Faculty of Medicine, University of Sydney, Sydney, Australia
3Drug and Alcohol Services, South East Sydney LHD, NSW Health, NSW, Australia
4National Cannabis Prevention and Information Centre, University of New South Wales, Australia
5Drug and Alcohol Clinical Services, Hunter New England LHD, NSW Ministry of Health, Australia
6School of Medicine and Public Health, Faculty of Health, University of Newcastle, Australia

Background and aims: Cannabis is a common recreational drug that is generally considered to have low addictive potential. However an increasing number of cannabis users are seeking treatment for...
dependence on the drug. There is interest in using agonist (substitution) pharmacotherapies to treat cannabis dependence and here we outline a novel approach involving a buccal spray (Nabiximols) that contains tetrahydrocannabinol (THC) and cannabidiol (CBD).

**Method:** Two double blind RCTs testing Nabiximols, first for treating cannabis withdrawal in an inpatient setting; and second, a protocol for a community based relapse prevention study will be presented.

**Results:** In the inpatient study, Nabiximols (peak dose 86.4 mg THC: 80 mg CBD) significantly suppressed cannabis withdrawal symptoms, retained patients in the inpatient treatment setting for longer, with no discernible intoxication or Adverse Event profile above that of placebo. A follow-up study examining longer-term (12 week) outpatient cannabis relapse prevention treatment using nabiximols is now underway (NHMRC project grant #1088902). The trial will address a range of issues important in future translation of nabiximols for cannabis dependence into routine clinical practice, including abuse liability, cognition and psychomotor performance, toxicological detection of illicit cannabis use additional to nabiximols, and cost effectiveness.

**Conclusions:** The development of an effective medication for assisting in the cessation of heavy cannabis use could have wide reaching clinical and public health benefits.

**Correspondence:** David Allsop; david.allsop@sydney.edu.au

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**A randomized controlled trial of mirtazapine for outpatient cannabis withdrawal**

Allsop, David J.1,2,3; Frewen, Amie1,2 and Montebello, Mark2

1Discipline of Addiction Medicine, Faculty of Medicine, University of Sydney, Sydney, Australia
2Drug and Alcohol Services, South East Sydney LHD, NSW Health, NSW, Australia
3Psychopharmacology Laboratory, School of Psychology, University of Sydney, Sydney, Australia

**Background and aims:** This study investigates the effectiveness of mirtazapine, a sedating antidepressant, in a population of adults seeking treatment for cannabis use.

**Method:** Measures of drug use, withdrawal symptoms and sleep disturbances were collected on 81 cannabis dependent treatment seekers presenting to a specialist outpatient drug and alcohol treatment facility in Sydney, Australia. Participants were randomised to receive mirtazapine or placebo (double blind) for 28 days as an adjunct to standard cognitive behaviour therapy (CBT).

**Results:** Cannabis use reduced significantly in both treatment groups from baseline to day 28, but the reduction was not significantly different between the mirtazapine group and the placebo group. Cannabis withdrawal, as measured by the Marijuana Withdrawal Checklist, was lower in the mirtazapine group at each timepoint than in the placebo group, but not at statistical significance. Sleep disturbance, as measured by the PSQI, was significantly suppressed by mirtazapine at day 28 relative to baseline, however a range of other sleep indicators were not impacted by mirtazapine. Mirtazapine did not influence changes in the levels of cannabis dependence between day 1 and day 28 of treatment, although both groups became markedly less dependent.

**Conclusions:** This study confirms that sleep disturbances during cannabis withdrawal can be attenuated by mirtazapine. However the lack of any enduring effect on cannabis use, cannabis withdrawal or treatment retention suggests that mirtazapine may not be a first line drug candidate for this indication.

**Correspondence:** David Allsop; david.allsop@sydney.edu.au

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**A randomized controlled trial of daily aerobic exercise for inpatient cannabis withdrawal**

Lintzeris, Nicholas1,2; Allsop, David J.1,2,3; Rooney, Kieron4; Arnold, Jonathon5 and McGregor, Iain3

1Discipline of Addiction Medicine, Faculty of Medicine, University of Sydney, Sydney, Australia
2Drug and Alcohol Services, South East Sydney LHD, NSW Health district, NSW Health, NSW, Australia
3Psychopharmacology Laboratory, School of Psychology, University of Sydney, Sydney, Australia
4Faculty of Health Sciences, University of Sydney, Australia
5School of Medical Sciences (Pharmacology), Sydney Medical School & Brain & Mind Research Institute
**Background and aims:** There is increasing scientific appreciation of the beneficial effects of regular exercise on mood, wellbeing and general health. Both preclinical and clinical studies also show that exercise “changes the brain”, boosting the proliferation and survival of new neurons (neurogenesis) and increasing the volume of brain regions involved in mood and cognition, such as the hippocampus. Exercise appears to have equivalent efficacy to antidepressants in improving mood in those suffering from mild to moderate depression. Emerging evidence in the addictions field suggests that exercise may also be of benefit for managing drug withdrawal and maintenance abstinence.

**Method:** The study is a prospective, parallel-group randomized controlled trial comparing an exercise versus control intervention across a range of cannabis detoxification outcome measures during a 7-day inpatient admission, with follow-up at 28 days post-discharge. Specifically, the study will compare severity of cannabis withdrawal and cannabis cravings, detoxification completion rates, and adverse events between the two conditions in an intention-to-treat analysis. Mechanisms by which exercise affects cannabis withdrawal will be assessed through the analysis of markers of endogenous cannabinoids, and plasma and urine THC levels.

**Results:** To date 11 patients have been recruited to this ongoing study (n = stretching, n = exercise), 10 of which remained in the hospital for the full 7 day duration. Five of those have been successfully followed up at 28 days post discharge. Out of the 5 participants that have been followed up so far, 4 have successfully remained abstinent since leaving the hospital. There have been nil serious adverse events. Data from the night-time adverse events checklist show that 1 participant in the stretching condition reported moderate difficulty concentrating and nausea, 1 participant in the cycling condition reported moderate sweating, diarrhoea and paranoia, and another participant in the cycling condition reported moderate memory problems. No adverse events were reported as severe.

**Conclusions:** There is somewhat surprising demand, uptake and adherence to a daily physical exercise regimen during inpatient cannabis detox.

**Correspondence:** Nicholas Lintzeris; Nicholas.Lintzeris@sesiah.health.nsw.gov.au

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**A randomized controlled trial of daily aerobic exercise for inpatient cannabis withdrawal – Cannabidiol (CBD) for the management of cannabis withdrawal: a phase II proof of concept study**

Pokorski, Izabella

National Cannabis Prevention and Information Centre, UNSW, Sydney, Australia

While other cannabinoids show promise, CBD has the added advantages of being non-intoxicating, safe for driving and potentially suitable for those with co-occurring mental health disorders. This feasibility study aimed to test the safety, feasibility and acceptability of CBD for alleviating cannabis withdrawal symptoms in a 6 night inpatient detoxification program, examining the impact of CBD on withdrawal severity, detoxification completion and adverse events in a single participant repeated measures design with n=5 participants receiving 300mg of CBD twice daily for 5 days and an additional 3 participants received 600mg twice daily. Overall withdrawal scale scores decreased and in the key symptoms of craving, sleep difficulties and irritability in addition to symptoms of anxiety and depression, with the higher dose group reporting larger decreases in stress and anxiety. Treatment completion rates were higher among participants receiving the higher dose. CBD was acceptable to participants and staff, with no adverse effects.
“Pure Rush”: Development of a serious game to educate young people about cannabis and illicit drugs
Nair, Natasha1,2; Reda, Bill1,2; Stapinski, Lexine1,2; Newton, Nicola1,2; Rodriguez, Daniel1,2; Chapman, Cath1,2; and Teesson, Maree1,2
1NHMRC Centre of Research Excellence in Mental Health and Substance Use, 2National Drug and Alcohol Research Centre, University of New South Wales, Sydney, Australia

Background and aims: Cannabis is the most widely used illicit drug among young people, with 12.7% of Australians aged 12 to 17 reporting use in the past year. There is clear need for early intervention to educate young people about the risks associated with cannabis and other drug use. Learning is most effective when it is interactive, enjoyable, and problem-based. Serious games utilise these principles and have the potential to engage adolescents who would not be receptive to traditional drug education. This paper describes the development of an arcade-style game, Pure Rush, which incorporates a social influence approach to educate young people about the harms associated with cannabis and other drug use.

Method: Initial consultation with Year 10 students (n=115) informed the development of a serious educational game called Pure Rush. Benefits of game play were examined in a sample of 200 Year 9 students, who were randomly allocated to receive a traditional drug education lesson, or gameplay combined with the traditional lesson. Engagement with the lesson and knowledge of cannabis effects and potential harms were assessed before and after the lesson.

Results: The overwhelming majority of students rated Pure Rush as enjoyable, age-appropriate, informative, understandable and useful. Results indicated that knowledge of cannabis-related harms increased in both groups; however enjoyment of the lesson was greater for students who received the gameplay lesson.

Conclusions: These preliminary results suggest serious games have the potential to engage young people with drug education and increase knowledge of the potential harms associated with cannabis and other drug use.

Correspondence: Natasha Nair; n.nair@unsw.edu.au

Metabolic studies of synthetic cannabinoids PB-22 and 5F-PB-22 by Cunninghamella elegans
Watanabe, Shimpei1; Kuzhiumparambil, Unnikrishnan1; Winiarski, Zofia2; Fu, Shanlin1
1Centre for Forensic Science, University of Technology, Sydney, Broadway, Australia
2Cell Biology Team, University of Technology, Sydney, Broadway, Australia

Background and aims: PB-22 and 5F-PB-22 are relatively new synthetic cannabinoids, which have been reported to be associated with deaths of users. This study intends to identify the metabolite profile of PB-22 and 5F-PB-22 produced by the fungus, Cunninghamella elegans, which has previously demonstrated the ability to produce metabolites of synthetic cannabinoids, JWH-018, JWH-073 and AM2201, in a similar manner to in vivo human studies.

Method: C. elegans cultures were grown in liquid media composed of glucose, glycerol, peptone, yeast extract, KH2PO4 and NaCl in distilled water. PB-22 and 5F-PB-22 were incubated with the fungal culture for 72h and the resulting metabolites were analysed by LC-MS/MS and HR-MS/MS techniques.
Results: Several metabolites were detected including ester hydrolysis products with and without monohydroxylation, and monohydroxylation for both compounds as well as oxidative defluorination for 5F-PB-22. These results are comparable with human hepatocyte and HLM studies.

Conclusions: The fungus *C. elegans* produced metabolites which correlate well with human hepatocyte and HLM studies. *C. elegans* model thus appears to be a promising platform for investigating synthetic cannabinoid metabolism. Furthermore, the ease of scaling up with this fungus model has the potential to allow structural characterisation of major metabolites by NMR and/or production of reference materials.

Correspondence: Watanabe, Shimpei; Shimpei.Watanabe@uts.edu.au

Strategies to enhance the effective dissemination of cannabis-related information to the criminal justice sector
Gannoni, Alex; Goldsmid, Susan; Coghlan, Sarah and Willis, Matthew

1Australian Institute of Criminology, Canberra, ACT, Australia

Background and aims: Persons in contact with the criminal justice system are significantly more likely to use cannabis and experience its associated harms than persons in the general population. Despite a wealth of policy and practice-relevant research-based information related to cannabis being generated, disseminating information to criminal justice practitioners presents ongoing challenges. The aim of this paper is to explore strategies for effective dissemination of evidence-based information to prevent cannabis use and related problems to criminal justice audiences.

Method: The AIC consulted with 44 representatives from police, corrections, courts and juvenile justice. The consultations focused on identifying key challenges and solutions related to effective dissemination and utilisation of evidence-based information.

Results: The most effective dissemination strategies were identified as those that utilised existing communication channels, tailored information formats to target audience needs, and outlined the relevance of the information to the target audience.

Conclusions: Findings from the consultations suggest that a one-size-fits-all approach is not appropriate. Engagement with and utilisation of cannabis related information in the criminal justice sector may be enhanced through selection of dissemination strategies that match the needs of the target audience. Regular engagement with criminal justice agencies to identify emerging information needs is also recommended.

Correspondence: Alex Gannoni; Alexandra.Gannoni@aic.gov.au

PLENARY SESSION 3
Marijuana: from the street to the clinic
Huestis, Marilyn

1National Institute on Drug Abuse, USA

Public opinion toward marijuana or cannabis is changing in the United States, with the movement towards medical (23 states and the District of Columbia) and legal (Washington, Colorado, Oregon and Alaska) cannabis. Cannabis is the most commonly used illicit drug in the world, and its use represents a major public health and safety problem. This is especially true for young people initiating cannabis smoking before age 16, a critical stage of brain development, as connections between different functional areas of the brain are changed, and brain volumes decreased. Decreases in intelligence, employment and increased enrollment in social welfare were documented in frequent, chronic cannabis smokers initiating use before the age of 15. Cannabis also impairs psychomotor impairment including driving. However, some cannabinoids have therapeutic potential and much more research is needed to make relevant new medications available. These potential pharmacotherapies require the same safety and efficacy requirements as other FDA-approved medications. The changing dynamics of cannabis medicalization and legal use and an appropriate

balance is needed to protect the public health and safety, and to provide well-controlled research to
develop safe and effective cannabinoid medications and delivery systems.

Jose Crippa: Translational research of cannabidiol (CBD) in neuropsychiatry

Kevin Sabet: Medicinal marijuana in the US

SESSION 4
Aboriginal and Torres Strait Islander communities
Alan Clough

SESSION 5
Cannabis Interventions

Early Intervention for Cannabis related offences – providing treatment options rather than court
Boyd, Lesley1
1WA Police, Alcohol & Drug Coordination Unit, Perth, Australia

Background and aims: August 2011 saw the introduction of the Cannabis Intervention Requirement
(CIR) scheme in WA, available to juveniles over 14 years who may receive up to two CIR’s and adults
on one occasion. This scheme aims to; a) Offer early intervention to first time offenders by directing
them to a health intervention session in preference to the justice system, particularly young people,
over 14; b) Encourage attendance at a one-on-one therapeutic intervention session about the legal
and health implications of cannabis through a ‘Sword of Damocles’ incentive; c) Arm people with
knowledge about the impacts of cannabis use and enable them to make informed, better choices
about cannabis use into the future; d) Reduce demand for Police and Judicial System resources
related to minor cannabis-related offending.

Method: In completing a CIS, approved drug counsellors’ conduct a one-on-one open discussion that
aims to engage the individual in a non-judgemental environment about; the adverse physical and
mental health effects relating to cannabis, increased awareness of the laws relating to drug use and
possession of drugs, social consequences of drug use and provide effective strategies to address
drug using behaviours.

Results: As of January 2015 more than 6,500 CIR notices have been issued and over 4,540 people
(69.6%) have been diverted from the criminal justice system to successfully complete their Cannabis
Intervention Session (CIS).

Conclusion: Early results from the scheme report a vast improvement in outcomes for Police and
Individuals. Individuals are using the opportunity to better understand the impact of cannabis on
their lives. Further, the monitoring of recidivism rates of the first 1000 individuals who completed
their CIS indicate more than 82% of people have not re-offended.

Correspondence: Lesley Boyd; lesley.boyd@police.wa.gov.au

Going online to reach people seeking help: early PotHelp progress
Milburn, Catherine1
1New Zealand Drug Foundation, New Zealand

Background: PotHelp is an innovative online self-help website offering support to people who want
to quit or cut back using cannabis. This is funded by the New Zealand Ministry of Health as part of a
wider drug demand reduction strategy. The aim is to provide a readily available gateway to
treatment for people ready to change.

Method: The website offers a non-threatening way for people to examine their cannabis use where
and when they’re ready to. A suite of interactive tools offers an entry point to self-directed change by individuals. This closely mirrors common approaches to therapy in the real world. Based on a foundation of video testimony from everyday Kiwis, a key aim is to assist visitors to acknowledge that change is possible. With motivation harnessed people are encouraged to regularly return to complete a series of online exercises, journal entries and view additional video.

Results: In the first 18 months of operation the website received over 27,000 visitors. Based on key indicators being measured, almost a third of visitors have shown signs of being highly engaged. However, the numbers registering are low, but those that do are deeply engaged. With support from an Expert Panel where website contents and usability is regularly reviewed, a schedule of improvements is expected to boost levels of activity. Initial feedback suggests that users value the website.

Conclusion: Providing online support for people with a drug dependency issue is showing early signs of being a valuable addition to treatment provision in New Zealand. As is common with web-based resources, significant effort and investment needs to be directed to usability enhancement in order to maximise the potential.

Correspondence: Catherine Milburn; Catherine.milburn@drugfoundation.org.nz

Pilot testing the first evidenced-based smartphone app for the self-management of cannabis use
Gibson, Lisa1; Rooke, Sally1 and Copeland, Jan1
1National Cannabis Prevention and Information Centre, UNSW, Sydney, NSW, Australia

Introduction: Cannabis is the most frequently used illicit drug in Australia, with almost 20% of ever users meeting criteria for a cannabis use disorder; however, less than one-third of those will receive treatment. To address this treatment gap, we developed a smartphone application for managing cannabis use, which has the potential to provide a private, readily accessible, and low-cost evidenced-based treatment alternative for cannabis users who want to quit or reduce their use.

Method: One hundred and eleven individuals (≥16 years) participated in a trial of the app which employed principles of MET and CBT – therapies that have been shown to effectively reduce cannabis use and related problems. Participants completed assessments of cannabis use, related problems, dependence, distress, and self-efficacy at baseline, after 4 weeks use of the app, and again at one-month following loss of access to the app.

Results: The key findings of the study show significant declines in participants’ cannabis use (p < .001), severity of dependence (p = .001), and distress (p = .002) following use of the app. Participants also reported significantly fewer cannabis-related problems (p < .001) and higher levels of self-efficacy in their ability to resist using cannabis (p < .001).

Discussion: Apps are a promising platform for the delivery of substance abuse interventions; however, they urgently require evidenced-based development and appropriate evaluation to ensure they are effective and have meaningful outcomes for users. This study demonstrates support for the efficacy of the first evidenced-based smartphone application intervention targeting the self-management of cannabis use.

Correspondence: Lisa Gibson; l.gibson@unsw.edu.au

Izabella Pokorski. Primary health care settings have been established as suitable settings for brief interventions for substance use related problems. This paper reports on the feasibility study of a very brief intervention for cannabis use in an ED setting in a pre-post design. The study (n=70) included follow-up data collected one-month following presentation to the ED and found the intervention was feasible and acceptable to participants. Further, compared with baseline, participants reported significantly fewer days of cannabis use; fewer cannabis-related problems and lower levels of dependence at one month follow-up. This has now been extended to a second site and including amphetamine type stimulants
SESSION 6
Cannabinoids and driving

Steer Clear
Milburn, Catherine¹
¹New Zealand Drug Foundation, New Zealand

Background and aims: Steer Clear is an evidence based behavior change drug driving campaign launched in February 2014. Steer Clear has two main behavior change goals. Increase the number of young people who: a) stop their friends from driving following cannabis use; b) choose not to drive following cannabis use.

Method: Steer Clear consists of several components to support the campaigns behavior change goals. These include the website, dope as drive (real life simulator) that travels the country to youth events, social media which encourages conversation and engagement, Real stories which captured users’ experiences around driving high some of these stories were turned into animated gifs to help illustrate the message, a crash pack that encourages people to stay over at a mates rather than driving high and Mind blown which consisted of a series of videos that highlighted the dangers of driving high.

Central to the campaign is that young people (the Crew) are involved in the co-creation of campaign elements and marketing.

Results: Baseline survey results confirmed our behavior change goals and target audience are correct, with many respondents having experienced getting in the car with drivers who were under the influence and believe it is ok or not sure to drive after using cannabis. The survey is currently being repeated. Evaluations from campaign components clearly indicate Steer Clear is reaching and engaging with a significant number of young people.

Conclusions: Steer Clear is an innovative, fun and effective targeted campaign to reduce cannabis and driving among young people. Steer Clear has been successful in starting an ongoing conversation that keeps young people thinking about the harmful effects of driving high.

Correspondence: Catherine Milburn; Catherine.milburn@drugfoundation.org.nz

Cannabis and driving
Drummer, Olaf H.¹
¹Victorian Institute of Forensic Medicine and Department of Forensic Medicine, Monash University, Southbank, Victoria, Australia

Campaigns to reduce drugged driving continue to be a major thrust of road safety by polices forces around Australia. After alcohol, cannabis (as Δ⁹-tetrahydrocannabinol, THC) is the most prevalent drug with a prevalence rate in fatally-injured drivers averaging 15% annually. Injured drivers tend to have a slightly lower incidence in Victoria at around 10%.

While cannabis can induce a range of cognitive and coordination deficits during its acute phase of intoxication it had been quite difficult to translate this to actual impairment, let alone raised crash risk, in an individual driver not showing signs of overt intoxication. A series of case control and broader epidemiological studies have been conducted in Australia and now in other parts of the world that now demonstrate an increased crash risk even when overt intoxication (or impairment) is not present. These studies are reviewed together with the difficulties associated with the assessment of the involvement of cannabis in individual cases.

Random roadside detection of drugs has been conducted in Victoria since late 2004 as a deterrent to drugged driving and is now conducted by all mainland states. In Victoria alone 100,000 drivers will tested this coming year with THC one of the banned drugs. Statistics on the detection rate will be provided and compared to that seen in other driver types.
Synthetic cannabinoids are being detected in persons who come to the attention of police or Coroners. These have included JWH-122, JWH-122-pentenyl derivative, CRA-13 and PB-22. The detection rate and the type of drugs detected will be described.

**Effects of cannabis with and without low dose alcohol on driving**
Huestis, Marilyn¹
¹National Institute on Drug Abuse, USA
Cannabis impairs psychomotor impairment including driving, a major road safety issue, as cannabis-involved injuries and fatalities are the highest worldwide for any illicit drug. Data from our controlled cannabis administration studies in occasional and chronic frequent cannabis smokers illustrate the pharmacodynamics and pharmacokinetics in these two populations that impact drug policy for cannabis impaired driving. Following frequent cannabis intake, a large body burden of cannabinoids develops that exerts effects on cognition and psychomotor performance. Recent meta-analyses of cannabis impaired driving clearly document an approximate two-fold increase in risk of injury or fatality if there is measurable blood THC, and increases with increasing blood THC concentration. Results of our controlled cannabis administration study, with and without low dose alcohol, in the world’s most advanced driving simulator, demonstrate the differences between cannabis and alcohol impaired driving, but show an additive impairing effect when combined.

**Prevalence of driving under the influence of cannabis in Australia**
Gates, Peter¹
¹National Cannabis Prevention and Information Centre, UNSW, Sydney, Australia

**Background and aims:** The aim of this presentation is to examine the prevalence of driving under the influence of cannabis in Australia.

**Method:** A large online survey was conducted through social media of over 4,600 Australians.

**Results:** Of those who identified recent cannabis use, almost 70% had ever driven while still under the influence of cannabis and 16% indicated they had driven on a daily basis. One quarter of the sample thought that it would be very unlikely that they would be tested for drug driving.

**Conclusions:** People who drive under the influence of cannabis may not be aware of the negative impact on driving skills or the rising likelihood of being tested for drug driving across Australia.

**Correspondence:** Peter Gates; p.gates@unsw.edu.au

**PLENARY SESSION 7**

**Studies of acute cannabinoid administration in humans: what’s the story with THC versus CBD?**
Solowij, Nadia¹; Broyd, Samantha¹; van Hell, Hendrika¹; Greenwood, Lisa-marie¹; Suo, Chao² and Yücel, Murat²
¹School of Psychology and Ψ-P3: Centre for Psychophysics, Psychophysiology and Psychopharmacology, University of Wollongong, Wollongong, Australia.
²Brain & Mental Health Laboratory, School of Psychological Sciences, Monash University, Victoria, Australia

**Background and aims:** Significant interest has arisen regarding opposing effects of the two primary compounds of cannabis: Δ⁸-tetrahydrocannabinol (THC) and cannabidiol (CBD). This talk will describe studies of acute administration of these compounds to humans.

**Method:** Sixty-five healthy volunteers with varying prior cannabis exposure (range 5 lifetime uses to daily use) participated in randomised controlled trials of administration of vaporised THC and CBD, each alone and in combination. Effects on psychological symptoms and cognition, and brain function by means of EEG or MRI, were examined in subsamples, comparing frequent and infrequent users. This overview talk will focus on symptoms, cognition and neurochemistry (GABA and glutamate
levels), while specific EEG and other MRI results will be presented by others.

**Results:** THC generally impaired all measures to a greater degree in infrequent than frequent users. CBD did not attenuate the effects of THC for most measures, but in some conditions enhanced these effects, especially at low doses of CBD combined with THC in less experienced users. CBD alone showed psychoactivity relative to placebo. The two compounds showed differential effects on brain glutamate and GABA levels which were associated with brain functional measures.

**Conclusions:** The results of these studies suggest complex interactions between THC and CBD on psychological and brain function that may vary with proportional dose and degree of prior exposure to cannabis. The implications of these findings will be discussed in the context of considering the therapeutic potential of these cannabinoids, as well as the legalisation of cannabis for recreational use.

**Correspondence:** Nadia Solowij; nadia@uow.edu.au

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**Repairing and preventing cannabis related brain harms: A dream or reality?**

Yücel, Murat1; Lorenzetti, Valentina1; Suo, Chao1; Lubman, Dan3; Solowij, Nadia3
1Brain and Mental Health Laboratory, School of Psychological Sciences, Monash University, Melbourne, Australia
2Turning Point, Eastern Health and Eastern Health Clinical School, Monash University, Melbourne, Australia
3School of Psychology and Illawarra Health and Medical Research Institute, University of Wollongong, Wollongong, Australia

**Background:** While cannabis holds therapeutic potential, prolonged, heavy use of cannabis, especially its primary psychoactive constituent - delta-9-tetrahydrocannabinol (THC), is associated with adverse effects on the brain, especially the hippocampus. The extent to which these harms recover with abstinence is unknown. Furthermore, while cannabidiol (CBD), another key constituent of cannabis, has been suggested to protect against such harms, this has not been adequately examined in humans.

**Method:** We sought to address these gaps in the literature by using MRI to compare the hippocampal integrity of long-term, regular cannabis users who were either exposed to THC but not CBD, or exposed to both THC and CBD. We also conducted similar comparisons for regular cannabis users with unknown exposure to CBD, as well as former users who remained abstinent for extended periods. Using 3T-MRI data, we derived three well-validated indices of hippocampal integrity – namely, volume; n-acetylaspartate (NAA); and fractional anisotropy.

**Results:** Hippocampal integrity is indeed significantly deteriorated in cannabis users relative to controls. However, this deterioration may be ameliorated by cannabidiol and recovered through prolonged abstinence from cannabis.

**Conclusions:** The findings have major and unique implications for how we conceptualize the long-term effects of cannabis use in humans and how harm to the brain may be minimized by modifying levels of CBD in cannabis, and/or recovered with abstinence. These relatively simple and accessible remedial options should be further researched so as to establish the ‘optimal’ level of each to achieve the most efficacious outcomes.

**Correspondence:** Murat Yücel; murat.yucel@monash.edu

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**Cannabis; private, clinical, scientific & public perspectives**

Large, Matthew1
1UNSW, Sydney, Australia

Cannabis is a touch-stone for heated debate. Protagonists have perspectives that originate in their own experiences of cannabis use, the scientific evidence about the effectiveness and dangers of cannabis and the perspective of public discourse about the regulation of cannabis.
The substantial material presented will relate to recent research about cannabis and psychotic illness such as schizophrenia. The presenter will outline recent meta-analytically derived data that describes the use of cannabis in relation to the i) course of cannabis use and the onset of schizophrenia, ii) the association between cannabis use and schizophrenia iii) the course of cannabis use after the onset of schizophrenia and the iv) effect of continued cannabis use and cannabis cessation on people who have developed symptoms of schizophrenia.

The presenter will attempt to integrate the different perspectives on cannabis use by drawing on his own experiences, including as a psychiatrist, the experience of being a cannabis researcher and the experience participating in the public debate about cannabis.

**SESSION 8**
Cannabis and brain function

**Cannabis use disorders and neuroanatomical alterations: Where is the evidence?**
Lorenzetti, Valentina1*, Batalla, Albert2,3* and Cousijn, Janna4
1Monash Clinical & Imaging Neuroscience, Monash University, Melbourne, Australia
2Tactus Addiction Treatment, 7400 AD Deventer, The Netherlands.
3Nijmegen Institute for Scientist-Practitioners in Addiction, 6500 HE Nijmegen, The Netherlands
4Departments of Developmental and Experimental Psychology, Utrecht University, Utrecht, The Netherlands
* authors with equal contributions

**Background and aims:** Cannabis use disorders (CUDs) affect 13.1 million individuals worldwide and represent the most vulnerable portion of regular cannabis users. Neuroanatomical adaptations specific to CUDs may mediate the significant adverse behavioral outcomes of CUDs.

**Method:** We reviewed findings from 20 structural neuroimaging studies on grey and white matter morphology in cannabis users that specifically included CUDs assessment.

**Results:** There is preliminary evidence for CUD-specific alterations within the striatum, medial temporal lobe, PFC, cerebellum and corpus callosum. Factors that may aggravate neurobiological alterations include earlier age of onset, higher lifetime exposure and CUD-associated problems, while abstinence may result in (partial) recovery. We cannot draw strong conclusions on CUD-specific neurobiological abnormalities given the lack of studies examining individuals with a diagnosed CUD.

**Conclusions:** The reviewed evidence on morphological abnormalities in CUDs indicate that there may be distinct neural substrates mediating cannabis addiction and compulsive use (e.g., striatum); and the neurotoxic effects of cannabinoids (e.g., hippocampus). Comparing subjects with and without CUDs is an essential step to characterize the neurobiology and develop new treatment strategies.

**Correspondence:** Valentina Lorenzetti valentina.lorenzetti@monash.edu

**Abnormal brain function in adolescent cannabis users: A systematic review of the evidence**
Lorenzetti, Valentina1; Alonso-Lana, Silvia1,3; Youssef, George1,4; Suo, Chao1; Cousijn, Janna5; Takagi, Michel6; Solowij, Nadia7 and Yücel, Murat1
1Monash Clinical and Imaging Neuroscience, School of Psychological Sciences & Monash Biomedical Imaging, Monash University, Clayton, Australia;
2FIDMAG Germanes Hospitalàries, Barcelona, Spain
3Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM), Spain
4School of Psychology, Faculty of Health, Deakin University, Australia
5Departments of Developmental and Experimental Psychology, Utrecht University, Utrecht, The Netherlands
Background and aims: Cannabis use typically commences during adolescence, a period during which the brain undergoes profound remodelling and is particularly vulnerable to the impact of environmental insults. Chronic cannabis exposure may harm the adolescent brain and behavior, as neural remodelling occurs most markedly in brain areas that are high in cannabinoid receptors and that mediate cognitive control and emotion regulation. We aimed to examine the evidence to date on the impact of regular cannabis use on adolescent brain function.

Method: We used PubMed and SCOPUS to systematically review findings from functional neuroimaging studies of adolescent cannabis users.

Results: Thirteen studies examined brain function in samples of cannabis users (aged 13 to 18 years), while they performed working memory, inhibition and reward processing tasks. The majority of the studies found altered brain function, but intact behavioral task performance in adolescent cannabis users relative to non-cannabis using controls. Neural abnormalities involved most consistently hyperactivity in frontal-parietal networks, which are typically ascribed to cognitive control. Higher chronicity of cannabis use was associated with abnormal brain function in most samples. Only a minority of studies controlled for the potential confounding influence of variables that can also undermine brain function, such as tobacco and alcohol use, higher psychopathology symptoms (conduct, anxiety, mood disorders) and family history of psychiatric disorders and substance use.

Conclusions: There is emerging evidence for abnormal frontal-parietal network activity in adolescent cannabis users, particularly in those with more chronic levels of use. Brain alterations may reflect a compensatory neural mechanism that is required to allow normal behavioural performance. It remains unclear if cannabis exposure is primarily responsible for these alterations.

Correspondence: Valentina Lorenzetti; valentina.lorenzetti@monash.edu

Acute effects of THC and CBD alone and in combination on default-mode connectivity: a functional resting-state MRI study
Broyd, Samantha1; van Hell, Hendrika1; Greenwood, Lisa-marie1; Suo, Chao2; Yücel, Murat2 and Solowij, Nadia1
1School of Psychology and Ψ-P3: Centre for Psychophysics, Psychophysiology and Psychopharmacology, University of Wollongong, Wollongong, Australia.
2Brain & Mental Health Laboratory, School of Psychological Sciences, Monash University, Victoria, Australia

Background and aims: Previous research suggests Δ9-tetrahydrocannabinol (THC) and cannabidiol (CBD) have opposite effects on cognition and brain function. THC is generally found to be psychotogenic and cognitively impairing, whilst CBD may ameliorate the deleterious effects of THC. In a double-blind crossover, placebo-controlled study, we examined the acute effects of THC and CBD alone and in combination on default-mode connectivity.

Method: Thirty volunteers (23 male) underwent four semi-randomised conditions (1.Placebo, 2.THC,6mg; 3.CBD,200mg; 4.THC,6mg+CBD,200mg) with BOLD images acquired during a 7 minute rest scan. Drugs were dissolved in 100% ethanol (serving as placebo) and vaporised using a Volcano® Vaporiser. Participants were divided into frequent and infrequent users on the basis of a median-split on lifetime cannabis use. Independent Components Analysis was used to identify the default-mode network and Region Of Interest analysis examined the effect of drug on functional connectivity in infrequent versus frequent users.

Results: Preliminary findings (n=23) suggest that relative to placebo, default mode connectivity in infrequent but not frequent users was impaired following both THC and CBD administration, albeit to a lesser extent with CBD. The combination of THC+CBD impaired connectivity relative to CBD, but
not THC, an effect that was again most pronounced in infrequent users.

**Conclusions:** As the first study to examine the effects of THC and CBD alone and in combination on default-mode connectivity, preliminary results indicate impairing effects of both compounds and not the opposing effects suggested in previous studies.

**Correspondence:** Samantha Broyd; sbroyd@uow.edu.au

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**Cannabidiol attenuates the effect of Δ9-tetrahydrocannabinol on EEG brain oscillations during rest**

Greenwood, Lisa-marie; van Hell, Hendrika H.; Broyd, Samantha; Croft, Rodney and Solowij, Nadia

**School of Psychology and Ψ-P3: Centre for Psychophysics, Psychophysiology and Psychopharmacology, University of Wollongong, Wollongong, Australia**

**Background and Aims:** Cannabidiol (CBD) is thought to ameliorate the psychotogenic and cognitively impairing effects of Δ9-tetrahydrocannabinol (THC), and its anxiolytic and antipsychotic properties are of therapeutic interest. The current study aimed to elucidate potential mechanisms by investigating the acute effects of THC and CBD, alone and in combination, on resting-state EEG activity as a function of prior cannabis exposure.

**Methods:** Fifteen frequent (FREQ) and 15 infrequent cannabis users (inFREQ) participated in a double-blind, placebo-controlled, cross-over study involving 5 randomised vaporised drug conditions: a) Placebo; b) THC-8mg; c) CBD-400mg; d) THC-8mg+CBD-4mg [LoCBD+THC]; e) THC-12mg+CBD-400mg [HiCBD+THC]. Electroencephalograph (EEG) data were recorded (5min; resting) before and after drug administration. Post-drug EEG power was corrected by subtracting pre-drug power for each frequency band: delta, theta, alpha, beta, gamma1 and gamma2.

**Results:** THC increased alpha, beta, gamma1 and gamma2 power relative to placebo and CBD. THC also increased beta, gamma1 and gamma2 frequency bands when compared to LoCBD+THC and HiCBD+THC. CBD, relative to placebo, increased power in gamma1, with a trend increase in beta and gamma2. Alpha power was larger for inFREQ than FREQ users under THC and CBD, although no condition by group interactions were observed.

**Conclusion:** While CBD alone tended to increase EEG power, when combined with THC, CBD attenuated EEG power increases observed following THC alone. These findings concur with previous studies showing attenuation of the effects of THC by CBD but further investigation of excitatory and inhibitory systems is required to understand the therapeutic potential of CBD.

**Correspondence:** Lisa-marie Greenwood; lgreenwo@uow.edu.au

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**SESSION 9**

**Cannabis prevention**

**Adolescent substance use and educational attainment: An integrative data analysis comparing cannabis and alcohol from three Australasian cohorts**

Silins, Edmund; Fergusson, David; Patton, George; Horwood, L. John; Olsson, Craig; Hutchinson, Delyse; Degenhardt, Louisa; Tait, Robert; Borschmann, Rohan; Coffey, Carolyn; Toumbourou, John; Najman, Jake; Mattick, Richard; for the Cannabis Cohorts Research Consortium

**National Drug and Alcohol Research Centre, UNSW Australia, Sydney**

**Christchurch Health and Development Study, Department of Psychological Medicine, University of Otago, Christchurch, New Zealand**

**Centre for Adolescent Health, Murdoch Childrens Research Institute, Royal Children’s Hospital, Melbourne**

**Department of Paediatrics, University of Melbourne, Melbourne, VIC, Australia**

**Centre for Social and Early Emotional Development, School of Psychology, Deakin University, Geelong, VIC, Australia**

**School of Population and Global Health, University of Melbourne, Melbourne, VIC, Australia**
Background and aims: The relative contributions of cannabis and alcohol use to educational outcomes are unclear. We examined the extent to which adolescent cannabis or alcohol use predicts educational attainment in emerging adulthood.

Method: Participant-level data were integrated from three longitudinal studies from Australia and New Zealand (Australian Temperament Project, Christchurch Health and Development Study, and Victorian Adolescent Health Cohort Study). The number of participants varied by analysis (N=2179-3678) and were assessed on multiple occasions between ages 13-25. We described the association between frequency of cannabis or alcohol use prior to age 17 and high school non-completion, university non-enrolment, and degree non-attainment by age 25. Two other measures of alcohol use in adolescence were also examined.

Results: After covariate adjustment using a propensity score approach, adolescent cannabis use (weekly+) was associated with 1½ to 2-fold increases in the odds of high school non-completion (OR=1·60, 95%CI=1·09, 2·35), university non-enrolment (OR=1·51, 95%CI=1·06, 2·13), and degree non-attainment (OR=1·96, 95%CI=1·36, 2·81). In contrast, adjusted associations for adolescent alcohol use were inconsistent and weaker. Attributable risk estimates indicated adolescent cannabis use accounted for a greater proportion of the overall rate of non-progression with formal education than adolescent alcohol use.

Conclusions: Findings are important to the debate about the relative harms of cannabis and alcohol use. Adolescent cannabis use is a better prognostic marker of lower educational attainment than adolescent alcohol use and identifies an important target population for preventive intervention.

Correspondence: Edmund Silins; e.silins@unsw.edu.au and Delyse Hutchinson, d.hutchinson@unsw.edu.au

Developmental trajectories of cannabis use among Australian adolescents: childhood predictors and young adult outcomes

Scholes-Balog, Kirsty E.1, 2; Hemphill, Sheryl A.1, 2, 3, 4, 5; Evans-Whipp, Tracy4; Toumbourou, John W.4, 5, 6 and Patton, George C.3, 4

Background and aims: Effective prevention of cannabis use and related harms relies on identification of developmental periods of vulnerability and determination of what places individuals at risk of experiencing negative cannabis-related consequences. To this end, this study aimed to identify distinct developmental trajectories of cannabis use among Australian adolescents, and to examine associations between trajectory group membership and 1) childhood social-environmental risk and protective factors; and 2) social and behavioural adjustment outcomes in young adulthood.

Methods: Participants were young people from Victoria, Australia (n=852, 53% female), who were part of the International Youth Development Study. Latent class growth analysis was used to identify distinct sub-groups of individuals who showed similar developmental patterns of cannabis use from average age 12 to average age 19.
Results: Three trajectories of cannabis use were identified: abstainers (62%), early onset users (11%), and late onset occasional users (27%). Early onset users were found to have the greatest number of behavioural adjustment problems at age 21. At age 11, risk factors associated with the community, family, and individual (e.g., rebelliousness) increased the risk of later membership in the early onset cannabis use group, while protective aspects of the family and school environment reduced the risk of later membership in this group.

Conclusions: Early onset of cannabis use, even at relatively low frequency during adolescence, places adolescents at risk of a range of adverse outcomes in young adulthood. Prevention and intervention efforts should focus on social-environmental factors during childhood, to delay or prevent uptake of cannabis use.

Correspondence: Kirsty Scholes-Balog; kirsty.balog@acu.edu.au

Internet-based prevention for alcohol and cannabis use: 12-month outcomes from a cluster randomised controlled trial
Champion, Katrina1,2,3, Newton, Nicola1,2,3, Stapinski, Lexine1,2,3, Slade, Tim1,2,3, Barrett, Emma1,2,3 and Teesson, Maree1,2,3
1NHMRC Centre of Research Excellence in Mental Health and Substance Use, 2National Drug and Alcohol Research Centre, 3University of New South Wales, Sydney, Australia

Background and aims: Alcohol and other drug use among young people is associated with significant social costs and harms. As such, there is a clear need to intervene early and deliver prevention before initiation to substance use occurs. This study aims to conduct a cross-validation trial of the Climate Schools: Alcohol and Cannabis course, an online school-based prevention program for alcohol and cannabis use.

Method: A cluster randomised controlled trial was conducted among 1103 students from 13 secondary schools in Sydney and Melbourne. Six schools received the Climate Schools: Alcohol and Cannabis course and seven schools were randomised to a control group (health education as usual). Students completed a self-report survey at baseline, post-intervention (80%) and at a 12-month follow-up (86%). Mixed-effects regressions compared the groups on alcohol and cannabis use, knowledge and intentions.

Results: Compared to the control group, immediately post-test the intervention group reported significantly greater alcohol and cannabis knowledge, were less likely to have consumed any alcohol (sip or taste) in the past six months and were less likely to intend on using alcohol in the future. However, there were no effects for binge drinking, cannabis use or intentions to use cannabis. Analyses of the 12-month data will also be conducted and reported.

Conclusions: These results provide added support for the online Climate Schools: Alcohol and Cannabis course as a feasible way of delivering alcohol and cannabis prevention. However analyses of longer-term follow-up data are need to provide a clearer indication of the efficacy of the intervention.

Correspondence: Katrina Champion; k.champion@unsw.edu.au

Survey of cannabis mass media campaigns
McDonald, Amanda1
1National Cannabis Prevention and Information Centre, UNSW, Sydney, Australia
PLENARY SESSION 10

David Penington:

My cannabis journey
Hopkins, Bob
My name is Bob, I'm a cannabis addict though not a practising one (albeit with the occasional lapse) for the last 15 years. Along the way I initiated the Nimbin drug law reform movement that remains the most prominent cannabis user advocacy organisation nationally, founding the Nimbin Hemp Embassy, stood as a drug law reform candidate on a number of occasions in the NSW State Elections, and kicked off the annual Nimbin Mardi Grass Fiesta. However I experienced a slow burn epiphany that resulted in a re-evaluation of both my own cannabis habit and a coming to odds with the HEMP (Help End Marijuana Prohibition) group over much of the information and attitudes they promulgated, especially with respect to their promotion of the use of cannabis and their support of free market distribution.

Cannabis 2.0 (US policy and commercialization)
Sabet, Kevin

POSTER ABSTRACTS

Perceived Knowledge, Attitude and Practices on Cannabis Use among Opioid Substituent Therapy (OST) Clients in Nepal
Acharya, Shiva Lal1, Howard, John2,3, Sagun Pant4, Lama, Kumar5, Shrestha, Ravi5, Paudel, Sanju6
1Ministry of Health and Population, Nepal CCM
2National Cannabis Prevention and Information Centre, University of New South Wales, Australia
3National Drug and Alcohol Research Centre, University of New South Wales, Australia
4Psychiatry Registrar and Medical Officer Saarathi Nepal Medical Unit
5SAARATHI NEPAL
6HIV and Human Rights Consultant

Background and aims: Globally, cannabis is the most prevalent type of illicit substance used among OST clients with estimates of concurrent use ranging from 50% to 85%. While there are concerns from those in Nepal providing Opioid Substitution Treatment (OST) about the prevalence of cannabis use, its potential impact on the physical and mental health of clients, treatment compliance, adherence to program, impacts on medication efficacy, and overall social and economic functioning, there is no local data to provide guidance.

Available international evidence as to the role of use of cannabis by people in OST and for those with HIV and HCV is equivocal. Some suggest a possible role of cannabis use easing induction to and exiting from MMT. However, others have identified issues, such as interactions with OST medications and a negative impact on liver disease in those with HCV, and WHO has advised caution.

This small exploratory survey at an NGO OST service in Kathmandu, Nepal aimed to assess prevalence of and reasons for cannabis use among ex-OST clients.

Method: Structured questionnaire, administered by Outreach Educators, and focus group discussion with ex OST clients.

Results: Mean age of the 20 ex-OST participants was 33, mean duration of cannabis use was 15 years, and weekly was use between 14 to 21 joints, with the majority using cannabis for pleasure, then to get ‘high’, to ‘trip’, increase appetite, relieve tension and for better sleep. Most used cannabis while initiating OST, stabilising on dose, and while withdrawing from OST. However, a
majority believed that cannabis use increased cravings after cessation of OST, and began or continued use of other substances, including pharmaceutical opioids and benzodiazepines in addition to cannabis.

Conclusions: Greater attention to cannabis use of people in OST, raising potential negative consequences and developing effective interventions for those wishing to reduce or cease its use. Research could also focus on cannabis use and plasma methadone concentrations, and the initiation and exacerbation of serious mental health disorders for those on OST.

Correspondence: Shiva Lal Acharya; shivaachrya@yahoo.com

An Evaluation of an Eight Week Group Treatment Programme Provided to Individuals Dependent on Cannabis
Campbell, Mark¹
¹Limerick Drug & Alcohol Treatment Service, Health Service Executive (HSE) Mid West, Ireland

Background and aims: Cannabis is by far the most widely used illicit drug in Ireland (NACD, 2011).¹ Among recent cannabis users 9% were classified as cannabis dependent and 17% met criteria for cannabis abuse (NACD, 2013).² The aim of the treatment programme was to enable participants to reduce their dependency on cannabis.

Methodology: The treatment intervention consisted of one assessment session followed by eight group sessions delivered weekly to individuals dependent on cannabis. The content of the assessment undertaken was taken from the Adolescent Cannabis Check Up (ACCU) baseline assessment (Martin et al., 2005).³ The content of the treatment programme was taken from the manual Motivational Enhancement Therapy (MET) & Cognitive Behavioural Therapy (CBT) for Adolescent Cannabis Users Volume 1, (Sampl & Kadden, 2001)⁴ and Volume 2 (Webb et al., 2001).⁵ A ‘Readiness to Change’ questionnaire (NCPIC, 2009)⁶ and a ‘Severity of Dependence’ (SOD) questionnaire (Gossop et al., 1995)⁷ were completed with participants at assessment and with those who completed treatment.

Results: Motivation to reduce use of cannabis was increased on completion of treatment. Participants considered their dependency greater on completion of treatment despite a self reported reduction in cannabis use.

Conclusions: The treatment programme was an effective means of retaining clients in treatment and increasing motivation to reduce or stop cannabis use. The increased knowledge gained by engaging in the programme altered participants perception of their severity of dependence. They acknowledged that their dependence was greater than they originally believed.

Correspondence: Mark Campbell, markt.campbell@hse.ie

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4. Sampl, S., & Kadden, R. Motivational Enhancement Therapy & Cognitive Behavioural Therapy for Adolescent Cannabis Users: 5 sessions, Cannabis Youth Treatment (CYT) Series Volume 1. Rockville, MD: Center for Substance Abuse Treatment, Substance Abuse & Mental Health Services Administration. BKD384


Findings from the DUMA program: Impact of reduced cannabis and methamphetamine supply on the consumption of illicit drugs and alcohol
Coghlan, Sarah1; Goldsmid, Susan1; Gannoni, Alex1 and Willis, Matthew1
1Australian Institute of Criminology, Canberra, ACT, Australia

Background and aims: Intervention strategies that are effective in terms of harm minimisation produce a decrease in use of that drug without resulting in a displacement of use. Cannabis and methamphetamine are two of the most commonly used illicit drugs in Australia. The aim of this paper is to examine the harm minimisation impact of experienced temporary reductions in supply of cannabis and methamphetamine.

Method: In quarter 3 of 2013, 550 detainees were interviewed through the Drug Use Monitoring in Australia program (DUMA). Detainees who indicated recent drug use were presented with questions to assess whether they had ever experienced a period when cannabis or methamphetamine was hard to get and if they had, how this had affected their use of that drug, alcohol and other drugs.

Results: Sixty percent and 47 percent of detainees reported recent use of cannabis and methamphetamine respectively. Both substances were reported to be readily available. Approximately half of users (50% cannabis; 44% methamphetamine) reported ever experiencing a period of reduced availability. Of these detainees, the majority reduced intake or abstained from using the drug (80% for cannabis; 78% for methamphetamine), and a significant percentage did not increase use of alcohol or other illicit drugs (62% for cannabis; 52% for methamphetamine), during this period.

Conclusions: The findings indicate that harm minimisation benefits may be realised through strategies aimed at reducing supply. However, cannabis and methamphetamine availability was reported to be high. Therefore, any periods of reduced availability may be temporary and localised.

Correspondence: Susan Goldsmid; susan.goldsmid@aic.gov.au

Memory, Attention and Learning in Frequent versus Infrequent Cannabis Users
Godber, Madeleine2; Broyd, Samantha1; van Hell, Erika1; Greenwood, Lisa-Marie1; Shaw, Beth1 and Solowij, Nadia1
1School of Psychology and Ψ-P3: Centre for Psychophysics, Psychophysiology and Psychopharmacology, University of Wollongong, Wollongong, Australia

Background and aims: Impaired cognition has been demonstrated in cannabis users beyond the period of acute intoxication, with poor memory, attention and learning most consistently observed. The extent to which cannabis use frequency is related to impairment in these cognitive domains is less certain and is the focus of this study.

Method: Fifty eight cannabis users aged 18.9 to 51.1 years were recruited from the general community to represent a wide range of exposure to cannabis. Cannabis use frequency ranged from 5 lifetime occasions through to daily use. Aspects of memory, attention and learning were assessed
using the Cogstate computerised test battery which included a verbal learning task, 2-back task, simple detection task and one-card learning task. Participants also completed a range of psychological and clinical assessments.

**Results:** Response accuracy and reaction time on the Cogstate battery will be compared between frequent and infrequent cannabis users, determined by a median split of frequency of use. We hypothesize that greater cannabis use frequency will be associated with greater impairment across all tasks. Correlations will be performed across the entire sample to examine associations between task performance and frequency of cannabis use among a range of other cannabis use measures (e.g. duration of use, age of onset), as well as other psychological variables (depression, anxiety, psychosis-proneness).

**Conclusions:** Cannabis is the most commonly used drug in Australia and is used both recreationally and chronically. The results of this study may help to clarify the extent to which impaired memory, attention and learning are associated with greater frequency and chronicity of use.

**Correspondence:** Madeleine Godber; mrg995@uowmail.edu.au

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**Cannabis and its use among Hindu Sadhus at Pashupatinath Temple, Kathmandu, Nepal**

Howard, John 1,2; Acharya, Shiva Lal3; Shrestha, Ravi4; Alam, Kumar3; Pant, Sagun Balev5; Sushil, Mahatma6 and Copland, Jan1

1National Cannabis Prevention and Information Centre, University of New South Wales, Australia
2National Drug and Alcohol Research Centre, University of New South Wales, Australia
3Ministry of Health and Population, National Center for AIDS and STD Control
4Saarathi Nepal
5Psychiatry Registrar and Medical Officer Sarathi Nepal Medical Unit
6Pashupatinath Temple, Kathmandu, Nepal

**Background and Aims:** Cannabis (ganja) has been used in Nepal for centuries and is mentioned in many Hindu scriptures, and is used for spiritual, cultural, medicinal and recreational purposes. Believed to be the loved substance of Hindu God Shiva, it is an integral part of Hindu society. However, its use and attitudes toward cannabis have been changing in recent years. Many clients on OST in Nepal claim that they use ganja for religious and spiritual reasons, and that its use is condoned by Lord Shiva and the Sadhus. However, there are concerns from the mental health field about cannabis use and psychosis, and from those providing Opioid Substitution Treatment that it may be associated with poor treatment compliance and relapse. The objective of this study was to assess the knowledge, attitude and practices of cannabis use among the Hindu Sadhus during Mahashivaratri festival 2014 at Pashupatinath Temple, Kathmandu.

**Method:** Using a structured questionnaire, in depth interview, 200 Sadhus of mean age 52 were interviewed at the Pashupatinath Temple.

**Results:** While 90% were daily users of ganja, other than for use by Sadhus to aid focus, concentration, meditation, self-control and relaxation, the majority believed that sacred scriptures do not indicate that Lord Shiva promoted its use. However, Naga Sadhus and those less educated were more dependent on ganja, believed Hindus should use it, that Lord Shiva condones its use, and give ganja to devotees. Only 64% of participants knew that cannabis was illegal in Nepal.

**Conclusions:** As a group, the Sadhus are poorly educated and hold diverse views as to the legality, and scriptural basis for use of ganja. Sadhus are influential, and the findings indicate a need to educate Sadhus about cannabis, involve them in policy development, and involve better informed Sadhus in the treatment of OST clients.

**Correspondence:** John Howard; jhhoward.work@gmail.com
The behavioural effects of synthetic cannabinoids AB-PINACA and AB-FUBINACA in adolescent rats during and following chronic administration
Kevin, Richard C.1; Wood, Katie E.1 and McGregor, Iain S.1
1School of Psychology, The University of Sydney, Sydney, Australia

**Background and aims:** The behavioural effects of recently detected synthetic cannabinoids (SCs) in recreational products are unclear, as most information originates from uncontrolled case studies and reports. This study aimed to confirm and extend these reports in a controlled setting by investigating the behavioural effects of the recently and increasingly detected SCs AB-PINACA and AB-FUBINACA in adolescent rats.

**Method:** Adolescence rats were chronically dosed every second day with AB-PINACA or AB-FUBINACA with 6 low doses (0.2 mg/kg) then 6 high doses (1 mg/kg). Their behavioural responses were compared with control and THC treated (6 x 1 mg/kg and 6 x 5 mg/kg) groups, dose-matched on peak hypothermic and bradycardic effects. Long-term impact on memory and social interaction was assessed following a 2 week washout period.

**Results:** Rats showed equivalent locomotor impairment for all cannabinoid compounds at both high and low doses, and cannabinoid treatment substantially increased anxiety-like behaviours and reduced weight gain compared to controls over the testing period. AB-FUBINACA also caused a mild conditioned place preference at a low dose, but no preference was observed for any compound at a high dose. Alarmingly, cannabinoid treated rats exhibited residual recognition memory impairment two weeks following drug cessation, which was particularly severe for AB-FUBINACA treated rats. Social interaction was unaffected in the long-term.

**Conclusions:** These results confirm many effects reported in human case studies, and also demonstrate potentially harmful long-term impacts. Additionally, these results demonstrate that equivalence in physiological effect (heart rate, body temperature, and weight gain) does not necessarily correspond to behavioural impairment. Even a small change in molecular structure is sufficient to produce this increased activity, so some chemical moieties may be important markers for identifying SCs with an increased risk of harm.

**Correspondence:** Richard Kevin; richard.kevin@sydney.edu.au

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Rapid Elimination of Carboxy-THC in a Cohort of Chronic Cannabis Users
Lewis, John1; Molnar, Anna2; Copeland, Jan3; Allsop, David J.4 and Fu, Shanlin2
1National Drug and Alcohol Research Centre UNSW Sydney
2Centre for Forensic Science, UTS, Sydney, NSW, Australia
3National Cannabis Prevention & Information Centre, UNSW, Sydney, NSW, Australia
4Dept. Psychology, Sydney University, Sydney, NSW, Australia

**Background:** Urinary 11-nor-Δ9-tetrahydrocannabinol-9-carboxylic acid (Carboxy-THC) concentrations, normalised to creatinine output, have been demonstrated to be a useful tool in the interpretation of the results of a series of urine tests for cannabis. These tests can be used to identify potential chronic cannabis users undergoing treatment for substance abuse or who may present occupational health and safety risks within the workplace. Conversely, the data can also be used to support claims of previous regular, rather than recent, cannabis use.

**Aim:** To corroborate other studies that showed the majority of chronic cannabis users eliminate cannabis from their urine within 1-2 weeks of becoming abstinent. Furthermore, the study aimed to identify both recidivists and those who claimed not to have re-used and who may have been unfairly treated as a result of a positive urine test.

**Method:** A cohort of chronic users underwent voluntary abstinence over a two-week period, and provided a supervised urine pre-abstinence and at two weekly intervals during abstinence.

**Results:** Out of 43 participants, the majority of chronic cannabis users (86%) reduced their urinary Carboxy-THC levels to below confirmatory cutoffs levels within two weeks. It was possible to
determine whether rises in the graphs of normalised cannabis: creatinine were the results of re-use or release of depot stored cannabis towards the end of the elimination.

**Conclusions:** This data can assist both drug treatment staff and Environmental Health and Safety officers in assessing both potential health and impairment risks presented by chronic cannabis users.

**Correspondence:** John Lewis; j.lewis@unsw.edu.au

**Verbal and visuospatial learning deficits in current and former chronic cannabis users**

Lorenzetti, Valentina¹; van Dalen, Yvonne²; Takagi, Michael³; Suo, Chao¹; Solowij, Nadia*⁴ and Yücel, Murat*¹

¹Monash Clinical & Imaging Neuroscience, School of Psychological Sciences and Monash Biomedical Imaging Facility, Monash University, Melbourne, Australia
²Faculty of Science, University of Amsterdam, The Netherlands
³Child Neuropsychology Unit, Murdoch Children’s Research Institute
⁴School of Psychology and Illawarra Health and Medical Research Institute, University of Wollongong, Wollongong, Australia

*authors with equal contributions

**Background and aims:** Emerging evidence shows learning deficits in regular cannabis users. It remains unclear whether these deficits selectively affect specific domains of learning (i.e., verbal, visuospatial) and persist over prolonged abstinence from cannabis. This study aims to examine verbal and visuospatial learning deficits in regular cannabis users, and whether prolonged abstinence recovers these deficits.

**Method:** We cross-sectionally examined 127 psychiatrically healthy participants. Of these, 69 participants were current chronic cannabis users (using for a mean 15 yrs), 12 were former users abstinent for ~2.5 yrs (after using for a mean of 16 yrs), and 46 were non-cannabis using controls. We measured verbal and visuospatial learning via the California Verbal Learning Test and the Brown Location Test, respectively.

**Results:** The impact of cannabis use on learning was specific to the examined cognitive domain (verbal vs visuospatial learning) and abstinence status (current vs former use). Verbal learning deficits emerged in both current and former cannabis users, in word acquisition (Trial 1, sum of Trials 1-5, Trial B) and recall trials (short- and long delay free recall, long delay cued recall). Visuospatial learning deficits were subtler. Current users, relative to controls, performed worse in only 2 out of 15 visuospatial learning variables (long delay recall and retroactive interference). Former users showed no visuospatial learning deficits.

**Conclusions:** Cannabis use is linked to verbal learning deficits regardless of abstinent status. Extended abstinence may recover (already subtle) visuospatial learning deficits observed in current users.

**Correspondence:** Murat Yücel; murat.yucel@monash.edu

**Cannabis Consumption, Emotional and Cognitive Disturbances and Depressive Symptoms In Young Adults**

Naz, Fauzia¹

¹Department of Applied Psychology, Queen Mary College, Lahore, Pakistan

**Background and aims:** Cannabis have devastating effects on memory, cognition and emotions thus leading to develop depressive symptoms in young adults (Marta, Paul, Alexander & Murray, 2007). The present study examined the effects of cannabis consumption on emotional and cognitive disturbances and depressive symptoms in young adults who use Cannabis. It was assumed that young adults who use cannabis will have higher emotional and cognitive disturbances and depressive symptoms in comparison with those who do not use cannabis. The research further
explored that severity of cannabis consumption will mediate between emotional and cognitive disturbances and depressive symptoms in young adults.

**Method:** Sample included 480 young adults who use cannabis in routine and 450 young adults who do not consume any kind of substance abuse with the age range of 20 to 27 years. A self-constructed Substance abuse scale, Cognitive Failure Questionnaire (Broadbent, Cooper, Gerald & Parkes;1982), Emotional Regulation Questionnaire (Gross & John, 2003) and Patient Health Questionnaire (PHQ-9; Spitzer, Williams & Kroenke, 2002) were used as assessment measures.

**Results:** Results of the study showed that young adults who use cannabis had higher emotional and cognitive disturbances and had severe depressive symptoms compared to the normal controls. Cannabis consumption had mediating relationship between cognitive and emotional disturbances and depressive symptoms.

**Conclusions:** The present research has serious implications for clinicians/generalphysicians dealing with young adults who consume cannabis.

**Correspondence:** Fauzia Naz; fauziakaramat@gmail.com

**Sustained attention and response inhibition in frequent versus infrequent cannabis users**

Shaw, Beth¹; Broyd, Samantha¹; van Hell, Erika¹; Greenwood, Lisa-Marie¹; Godber, Madeleine¹ and Solowij, Nadia²

¹School of Psychology and Ψ-P3: Centre for Psychophysics, Psychophysiology and Psychopharmacology, University of Wollongong, Wollongong, Australia

**Background and aims:** Cannabis intoxication is associated with deficits in sustained attention and response inhibition. However, these deficits have been inconsistently reported as impaired beyond the period of acute intoxication in regular users. Further exploration is warranted in particular to determine the parameters of cannabis use that may be associated with impaired attention and response inhibition in cannabis users in the unintoxicated state.

**Method:** Thirty frequent (>100 uses in lifetime) and thirty infrequent (<100 uses in lifetime) cannabis users will be recruited from the general community. Participants will complete a Stop Signal Reaction Time (SSRT) task and a Continuous Performance task – Identical Pairs (CPT-IP) Version. Participants will also complete a range of psychological symptom assessments.

**Results:** We hypothesise that relative to infrequent cannabis users, frequent users will (1) have longer reaction times and produce more errors during the CPT-IP; and (2) have increased errors of commission and omission, as well as altered stop-signal reaction time during the SSRT task. We further hypothesise that poorer performance will be correlated with greater frequency of cannabis use, as well as other use parameters (eg. duration of use, age of onset) and psychological symptom measures.

**Conclusions:** Cannabis use varies dramatically from individual to individual, from intermittent to daily use. This study will determine the effect of frequency of cannabis use on sustained attention and response inhibition to aid in understanding the extent of sustained deficits in cannabis users in the unintoxicated state.

**Correspondence:** Beth Shaw; bss796@uowmail.edu.au

**Metabolic studies of synthetic cannabinoids UR-144 and SLR-11 by Cunninghamella elegans**

Watanabe, Shimpei¹; Nguyen, My Ann¹: Kuzhiumparambil, Unnikrishnan¹; Cameron, Jane²; Fu, Shanlin¹

¹Centre for Forensic Science, University of Technology, Sydney, Broadway, Australia

²Cell Biology Team, University of Technology, Sydney, Broadway, Australia

**Background and aims:** With the rapid introduction of new synthetic designer drugs into the market, it is important to investigate the metabolic profile for drug testing purposes. This study intends to identify the metabolite profile of UR-144 and XLR-11 produced by Cunninghamella elegans, which
has previously demonstrated the ability to produce metabolites of synthetic cannabinoids, JWH-018, JWH-073 and AM2201 in a similar manner to in vivo human and in vitro human liver microsomes (HLM) studies.

**Method:** *C. elegans* cultures were grown in liquid media composed of glucose, glycerol, peptone, yeast extract, KH$_2$PO$_4$ and NaCl in distilled water. UR-144 and XLR-11 were incubated with the fungal culture for 72h and the resulting metabolites were analysed by LC-MS/MS and HR-MS/MS techniques.

**Results:** Several metabolites were detected including monohydroxylation, dihydroxylation, and despentylhydroxylation for UR-144 and monohydroxylation, carboxylation and oxidative defluorination for XLR-11. These results are comparable with previously reported studies.

**Conclusions:** The fungus *C. elegans* produced metabolites which correlate well with human and other in vitro models. *C. elegans* model thus appears to be a promising platform for investigating synthetic cannabinoid metabolism. Furthermore, the ease of scaling up with this fungus model has the potential to allow structural characterisation of major metabolites by NMR and/or production of reference materials.

**Correspondence:** Watanabe, Shimpei; Shimpei.Watanabe@uts.edu.au