

Methamphetamines and Cannabinoids in the Context of Forensic Mental State Evaluations: An Overview

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UPDATES

Any updates to the slides for this presentation and a
final reference list will be available here:

www.afnpc.com/AAFP2026

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American Academy
of Forensic Psychology

Neither we nor any members of our immediate families have any significant financial arrangement or affiliation with any product or services used or discussed in this presentation, nor any potential bias against another product or service.

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Caveats & Comments

1. There are genuine limits to our understanding of the effects of recreational drugs on mental state.

2. Often, people may be unaware of some of the drugs they have consumed.

3. Outside of alcohol, reported quantity of drug used can be misleading or inaccurate.

4. UDS: Identification vs. Quantification

5. Blood assay: values in serum v. whole blood

6. Understand that we are not here to advocate for or against legalization of any recreational drugs.

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U.S. Drug Use, Past Year, 2002-2024

Year	Alcohol	Cannabis	Cocaine	Tobacco	Meth	Heroin
2002	65	10	1	35	0.5	0.2
2005	65	10	1	35	0.5	0.2
2008	65	10	1	35	0.5	0.2
2011	65	10	1	35	0.5	0.2
2014	65	10	1	35	0.5	0.2
2017	65	10	1	35	0.5	0.2
2019	65	10	1	35	0.5	0.2
2021	65	20	1	30	0.5	0.2
2023	65	25	1	25	0.5	0.2
2024	65	25	1	25	0.5	0.2

Data from National Survey on Drug Use and Health, Substance Abuse and Mental Health Services Administration, <https://nsduhweb.rti.org/gfresweb/homepage.cfm>

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U.S. Drug Use, Past Year, 2002-2024

Year	Meth	Cocaine	Heroin
2002	0.5	2.5	0.2
2005	0.5	2.5	0.2
2008	0.5	2.5	0.2
2011	0.5	2.5	0.2
2014	0.5	2.5	0.2
2017	0.5	2.5	0.2
2019	0.5	2.5	0.2
2021	0.8	2.5	0.2
2023	0.8	2.5	0.2
2024	0.8	2.5	0.2

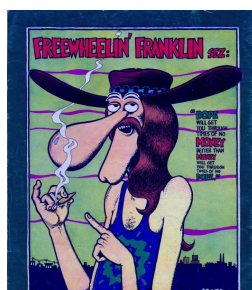
Data from National Survey on Drug Use and Health, Substance Abuse and Mental Health Services Administration, <https://nsduhweb.rti.org/gfresweb/homepage.cfm>

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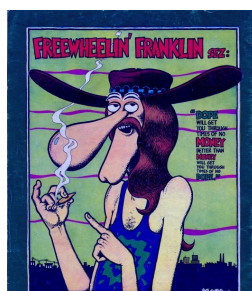
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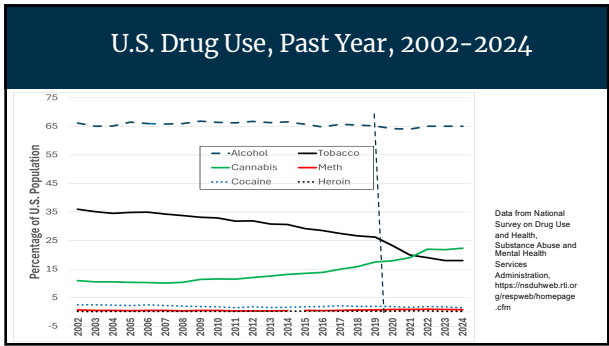
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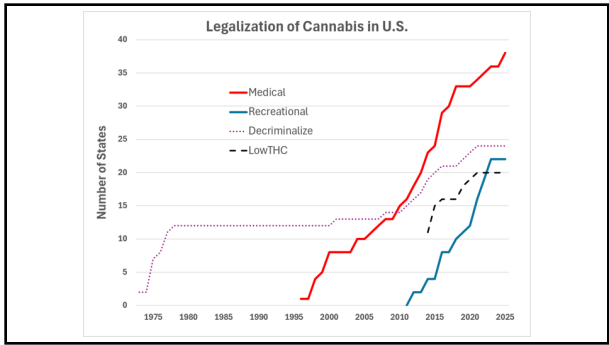
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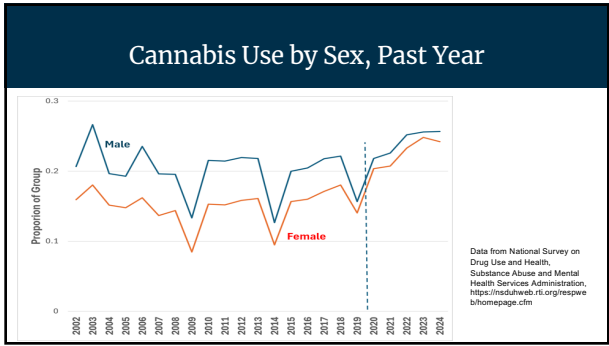
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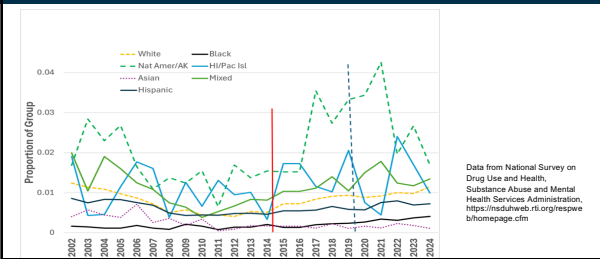


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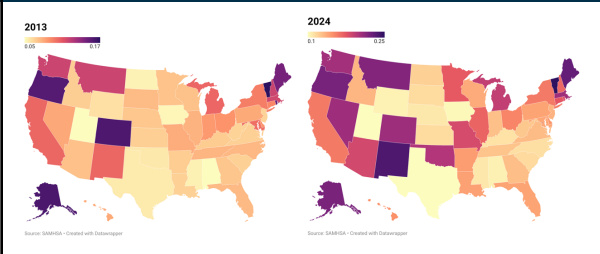
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Cannabis Use by Race/Ethnicity, Past Year



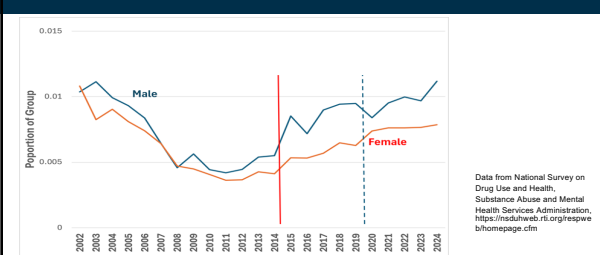
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Marijuana Use, past month, by State

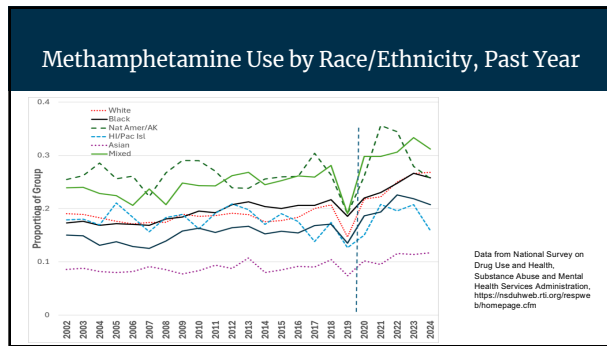


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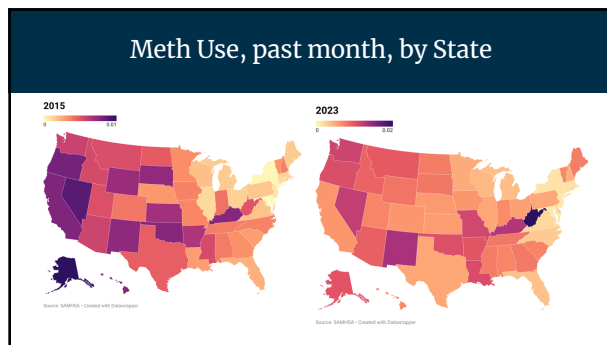
Methamphetamine Use by Sex, Past Year



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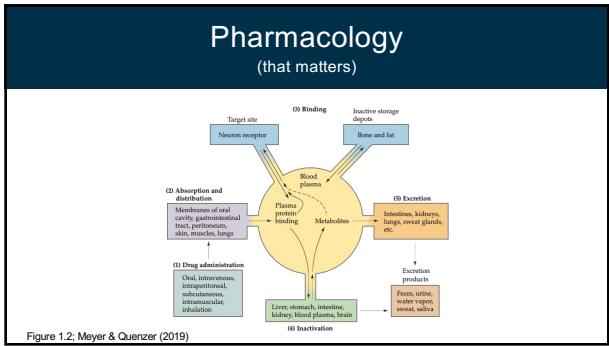
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Pharmacology

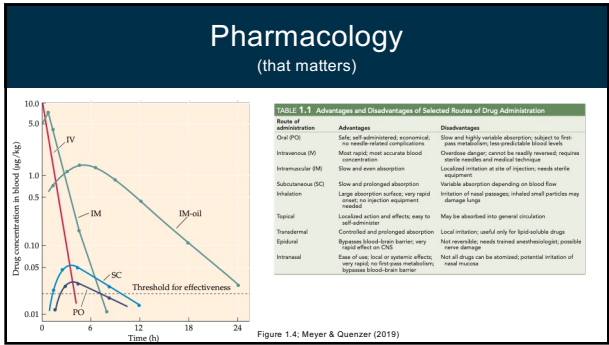
(that matters)

Pharmacokinetics v. Pharmacodynamics

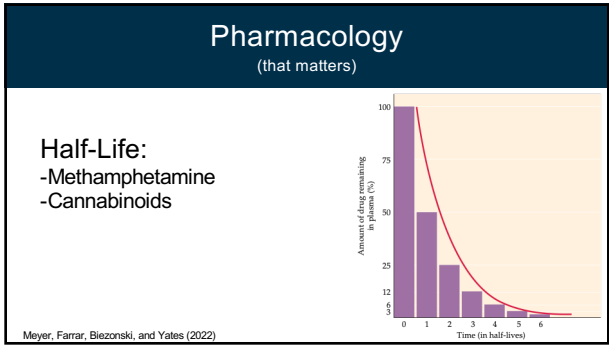
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Pharmacology

(that matters)

Drug Tolerance

- Pharmacokinetic (metabolic)
- Pharmacodynamic
 - Acute
 - Chronic
- Behavioral
- Reverse Tolerance

TABLE 1.8 Significant Characteristics of Tolerance

It is reversible when drug use stops.

It is dependent on dose and frequency of drug use and the drug-taking environment.

It may occur rapidly, after long periods of chronic use, or never.

Not all effects of a drug show the same degree of tolerance.

Several different mechanisms explain multiple forms of tolerance.

Meyer & Quenzer (2019)

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Pharmacology

(that matters)

TABLE 1.9 Types of Tolerance Exhibited by Selected Drugs

Drug or drug class	Metabolic tolerance	Pharmacodynamic tolerance	Behavioral tolerance
Barbiturates	+	+	+
Alcohol	+	+	+
Morphine	+	+	+
Amphetamine	-	+	+
Cocaine	-	+	+
Caffeine	-	+	?
Nicotine	-	+	?
LSD	-	+	-

Note: + indicates that the drug produces the type of tolerance indicated; - indicates that the drug does not produce the indicated type of tolerance; ? indicates that evidence is mixed regarding whether the drug produces the indicated type of tolerance.

Meyer & Quenzer (2019)

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Pharmacology

(that matters)

Drug (US) → Reflexive → Cortical arousal, euphoria, etc. (UR)

Drug paraphernalia (neutral stimulus) + Drug (US) → Reflexive → Cortical arousal, euphoria, etc. (UR)

Drug paraphernalia (CS) → Conditioned reflex → Cortical arousal, euphoria, craving, etc. (CR)

Figure 1.22: Meyer & Quenzer (2019)

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Pharmacology (that matters)

Drug Dependence

- Physical dependence
- Abstinence / withdrawal syndrome
- Concepts of addiction

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Pharmacology (that matters)

6 Windows of Risk / Impact:

- Acute Exposure
- Chronic Exposure
- Prenatal Exposure
- Adolescent Exposure
- Withdrawal
- Aging

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Pharmacology of Methamphetamine

Psychostimulants

Methamphetamine

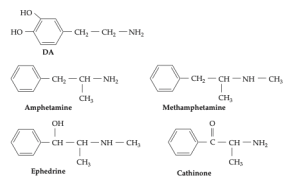


FIGURE 12.13 Amphetamine and related psychostimulants resemble the neurotransmitter DA in their chemical structure. This accounts for their potent effects on the dopaminergic system.

Meyer & Quenzer (2019)

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Pharmacology of Methamphetamine

- Acute and Relevant Effects
- Adverse Effects
 - Dependence
 - Withdrawal
 - Cognitive deficits

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Pharmacology of Methamphetamine

TABLE 12.1 Mild to Moderate versus Severe Behavioral and Subjective Effects of Cocaine and Other Psychostimulants in Humans*

Mild to moderate effects	Severe effects
Mood amplification; both euphoria and dysphoria	Irritability, hostility, anxiety, fear, withdrawal
Heightened energy	Extreme energy or exhaustion
Sleep disturbance, insomnia	Total insomnia
Motor excitement, restlessness	Compulsive motor stereotypies
Talkativeness, pressure of speech	Rambling, incoherent speech
Hyperactive ideation	Disjointed flight of ideas
Increased sexual interest	Decreased sexual interest
Anger, verbal aggression	Possible extreme violence
Mild to moderate anorexia	Total anorexia
Inflated self-esteem	Delusions of grandiosity

Source: From Post and Connel, 1983.
*The actual effects observed show individual variability and depend on the dose, route of administration, pattern and duration of use, and environmental context.

Meyer & Quenzer (2019)

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Pharmacology of Methamphetamine

Table 1
The cognitive deficits associated with methamphetamine use disorder.

Cognitive domain	Number of studies	Cohen's d	p
Global cognition ^a	27	0.462	0.0001
Attention ^a	4	0.425	0.042
Executive functions ^a	27	0.486	0.0001
Impulsivity	8	0.926	0.0001
Language/verbal fluency ^a	14	0.426	0.0001
Social cognition	3	1.117	0.0001
Speed of processing ^a	19	0.336	0.0001
Verbal learning ^a	13	0.387	0.0001
Verbal memory	14	0.400	0.0001
Visual learning ^a	5	0.275	0.156
Visual memory ^a	7	0.473	0.001
Visuo-spatial abilities ^a	4	0.387	0.004
Working memory	15	0.509	0.0001

Potvin et al. (2018)

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Pharmacology of Methamphetamine

Adverse Effects

- Prenatal Exposure
- Adolescent Exposure
- Psychiatric Concerns (stay tuned...)

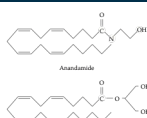
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Pharmacology of Cannabinoids

The Rise of CBD, Δ8-THC, Δ10-THC, THC-O, THC-P...

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Pharmacology of Cannabinoids



2-Arachidonoylglycerol (2-AG)

FIGURE 14.10 Chemical structures of the endocannabinoids anandamide (AEA) and 2-arachidonoylglycerol (2-AG)

Meyer, et al. (2022)

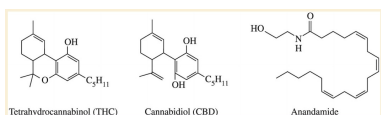


Figure 8-1 Julien, Ph.D., Robert M.; Adickat, Claire D.; Cornsby, Joseph E. *Julien's Primer of Drug*

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What Is Cannabis?

Three Accepted Species in Genus

- *Cannabis sativa* (hemp – tall, woody)
- *Cannabis indica* (grown in India – shorter and higher THC)
- *Cannabis ruderalis* (northern Europe and Asia – short growth period, low potency)

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Pharmacology of Cannabinoids

- Tetrahydrocannabinol (THC)
 - Psychoactive ingredient
 - Stimulatory, sedating, analgesic, hallucinatory effects; not related to psychostimulants
- Challenges to cannabis study
 - Cultivation advances
 - Social attitude changes and legal status
 - Synthetic cannabinoid use; novel compounds
- Cannabidiol (CBD)
 - Cannabis ingredient with potential medical use

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What Is Cannabis?

Components

- Cannabis plant type includes marijuana, hashish, charas, bhang, ganja, and sinsemilla
- Concentration of THC in marijuana increased from 3 to 12 percent
- Psychedelic potency varies with strains

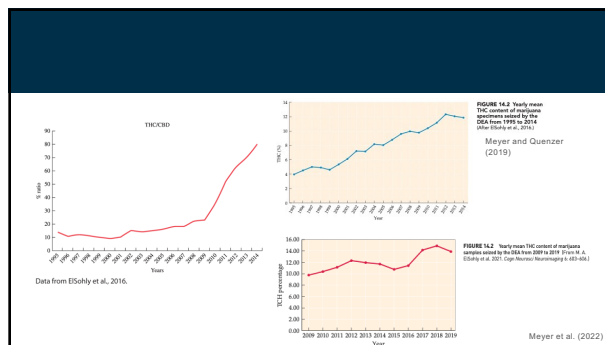
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What Is Cannabis?

Forms of THC and CBD in Cannabis

- Tetrahydrocannabinolic acid (THCa) and cannabidiolic acid (CBDA) convert to active forms (THC and CBD) through decarboxylation
- Decarboxylation
 - Converts THCa to THC
 - Also converts THC into inactive metabolite (carboxy-THC) that is excreted in urine

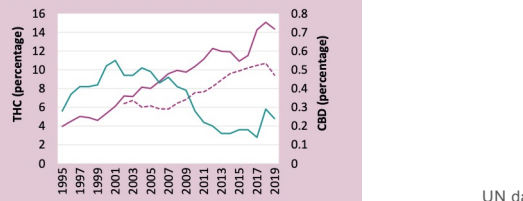
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Pharmacology of Cannabinoids

Cannabis potency (Δ^9 -THC content) and CBD in cannabis herb in Europe and the United States



UN data

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Pharmacology of Cannabinoids

TABLE 3 Average THC content per gram of cannabis products sold in Colorado, 2020

Product	Average THC (percentage) by weight
Flower	16.07
Shake/Trim	17.03
Concentrates	67.82
500 mg cartridge (each)	79.67
Oil	73.6
Resin	71.6
Shatter	70.97
Sugar	70.93
Wax	70.93
Butter	67.34
Hash	61.4

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Pharmacology of Cannabinoids

CB1 and CB2

- First and second discovered cannabinoid receptors
- In family of G-protein-coupled receptors (GPCRs)
- Dopaminergic activity increased by short-term THC use and decreased by chronic use
- Functional selectivity; biased agonism

CB1

- Located in CNS (concentrations similar to GABA and glutamate) and throughout body
- Basal ganglia: motor performance
- Cerebellum: motor performance
- Hippocampus: memory
- Prefrontal cortex: attention, memory, concentration

CB2

- Located primarily in the immune system tissues and outside CNS

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Mechanism of Action:

CB1 and CB2

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CB2

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Pharmacokinetics

THC

- Administration
 - Hand-rolled marijuana cigarette (joint)
 - Amount absorbed rapidly and completely in bloodstream dependent on multiple variables; estimate range from 5 to 60 percent of available THC absorbed into body
 - Initial metabolite, 11-hydroxy-THC, is comparably psychoactive and is quickly broken down into the inactive compound, 11-nor-9-carboxy-THC (THC-COOH)
 - Dabbing
 - Highly concentrated THC pass butane through cannabis ("blasting"); butane hash oil (BHO); THC concentration up to 80 percent
 - BHO vaporized by heating and inhaled ("dabbed") through water pipe (oil rig)
 - Vaping
 - Hash oil or marijuana in vape device or e-cigarette
 - Vaping BHO at least 60 percent THC; marijuana typically about 12 percent

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Pharmacokinetics

Distribution

- THC is taken out of blood quickly and moves into fatty tissue
- 25 to 30 percent of single dose may remain in fatty tissue for week; continuous doses accumulate in fat, may take weeks to leave after use stops
- Delay tends to form type of reverse tolerance to drug

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Pharmacokinetics

Detection

- THC urine testing focuses on carboxy-THC identification that is slowly excreted with varied half-life
 - Infrequent smokers: Positive for 1 to 3 days
 - Chronic smokers: 7 to 21 days
- Little or no correlation between the presence of carboxy-THC in urine and the presence of a pharmacologically significant amount of THC in the blood

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Pharmacokinetics

Potency and Research

- NIDA-supplied cannabis is not comparable to that used for medicinal or recreational purposes; allowed amount for research recently increased from 21 to 650 kilograms

Orally Ingested Marijuana

- Onset delayed
- Acidic degradation, enzyme action, and "first-pass metabolism" may reduce potency by two-thirds
- Longer lasting effects after absorption; no smoking affects
- Food produces with THC: More intense and longer high
- Even when legal, questionable product labelling found

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Pharmacokinetics

Cannabidiol

- Pharmacokinetic CBD effects: Half life
 - Following IV administration = 8 and 33 hours
 - Following smoking = 27 and 35 hours
 - Following oral IV administration = 2 and 5 days
- Potent inhibitor of multiple cytochrome enzymes may elevate other drug blood concentrations.
- THC or CBD bind to FABPs and block anandamide from attaching to FABPs; less metabolism results.

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Pharmacological Effects on Cannabis

Complications Related to Cannabis Pharmacology

- Realization of the opposing actions of CBD and THC
- Variability of the CBD-to-THC ratio among diverse cannabis plant products
- Increased potency of these and perhaps other components of the cannabis plant
- Drug interactions between cannabis and standard medications

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Synthetic Cannabinoid Agonists of Abuse

Current SC Abuse

- Spice and other related compounds
 - Sold via head shops and the Internet as powder and liquid cartridges (e-cigarette)
 - Produce psychoactive effects
 - Easily available, cheap
 - Difficult to detect
 - Classified as Schedule 1 compound; banned in the United States

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Synthetic Cannabinoid Agonists of Abuse

Pharmacological, Physiological, and Psychoactive Effects and Toxicity

- Basic pharmacology and pharmacokinetics of synthetic cannabinoids is unknown; effects in pregnancy not reported
- Research findings
 - Acute psychosis triggered in vulnerable individuals (Winstock and Barratt)
 - Clinical symptoms include excited delirium, AKI, seizures, hallucination, cardiotoxic effects, coma, death (Trecki and colleagues)
 - Withdrawal symptoms (Murphy and colleagues)
- No pharmacologically specific antidote

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Acute and Chronic Psychoactive Effects (cont.)

- Subjective effects
 - Vary with dose, administration route and setting, user experience, and vulnerability
 - Increased sense of well-being, mild euphoria, relaxation, anxiety relief
- Psychomotor effects
 - Impairments in coordination, perception, reaction time, and divided attention; persist for several hours beyond one's perception of the "high"
 - Functional effects (may impair performance of driving, working, or at school)
 - Increased risk greatly potentiated by concomitant use of alcohol

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Acute and Chronic Psychoactive Effects (cont.)

- Cognitive effects
 - All memory stages impaired, attention focus and filtering impaired, performance motivation reduced
 - CB1 receptors in hippocampus mediate memory-disrupting effect, low blood flow to brain; long-term effects for heavy users may be partially genetic influence

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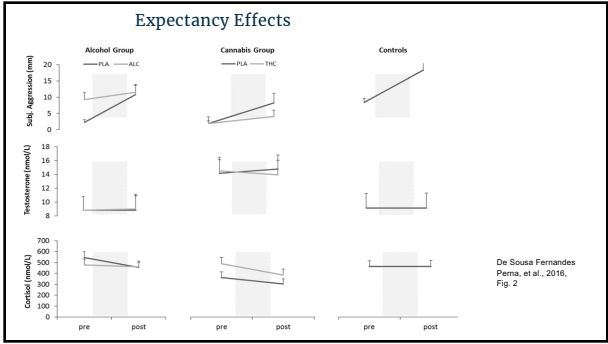
TABLE 14.1 Summary of Acute and Chronic Effects of Cannabinoid Exposure on Cognitive Processes

Acute effects
Impaired verbal learning and memory
Impaired working memory
Impaired attention (task- and dose-dependent)
Impaired inhibitory control and (to a lesser extent) other executive functions
Impaired psychomotor function
Chronic effects
Impaired verbal learning and memory
Impaired attention; attentional bias
Possibly impaired psychomotor function
Possibly impaired executive function (depending on frequency of use and age of onset)
Recovery of function with abstinence
Likely persistent effects on attention and psychomotor function
Possibly persistent effects on verbal learning and memory (insufficient and mixed evidence)

Source: Alter S. J., Broyd et al. 2016. *Biol Psychiatry* 79: 557-567.

Meyer et al. (2022)

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Methamphetamine as Therapeutic Agent

TABLE 16.1 Examples of Psychostimulants Used as Therapeutics in the United States

Drug	Trade Names	Medical Indications
Amphetamine	Adderall [®]	ADHD, narcolepsy, weight control
	Dexedrine [®]	
	Dextrostat [®]	
Diethylpropion	Tenuate [®]	Weight control
Methamphetamine	Adipex [®]	ADHD, weight control
	Methedrine [®]	
Methylphenidate	Ritalin [®]	ADHD, narcolepsy
Phentermine	Adipex-P [®]	Weight control
	Fastin [®]	
	Ionamin [®]	

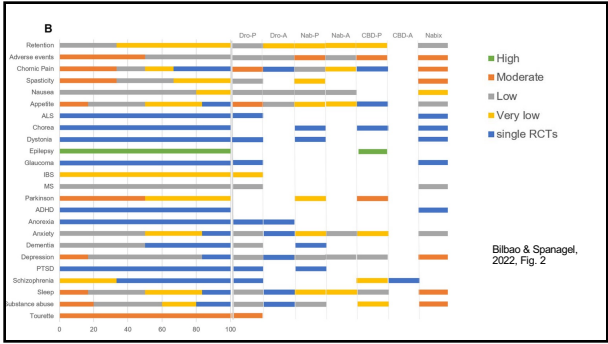
Howell & Kimmel (2007)

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Cannabis as Therapeutic Agent

- Bilbao & Spanagel 2025 meta-analysis
 - 24 medical conditions
 - 3 FDA-approved medications + CBD
 - Marinol (dronabinol)
 - Cesamet (nabilone)
 - Sativex (nabiximols) – available in multiple c

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Cannabinoids as Therapeutic Agent

&

- Significant therapeutic effect
 - CBD
 - Epilepsy (-0.5), Parkinsonism (-0.41)
- Moderate therapeutic effect
 - Dronabinol
 - Chronic Pain (-.31), Appetite (-.51), Tourette (-1.01)
 - Sativex
 - Chronic Pain (-.25), Spasticity (-.36), Sleep (-.24), SUDS (-.48)

- Bilbao & Spanagel, 2025

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Cannabinoids as Therapeutic Agent

&

Disorder	Hedge's g	OR (95% CI)
Depression	0.00	(-0.17, 0.17)
Depri-glacibao	-0.05	(-0.20, 0.10)
Anxiety	-0.12	(-0.29, 0.05)
Anti-glacibao	-0.25	(-0.49, -0.01)
ADHD-tin	-0.00	(-0.72, 0.72)
Tourette's	-0.46	(-1.32, 0.40)
Tour-din	-0.84	(-2.10, 0.42)
PTSD-tin	-1.13	(-1.48, -0.78)
Psychosis+	-0.20	(-0.45, 0.05)
Psychosis-	0.36	(0.10, 0.62)

I. Black, Stockings, et al., 2019

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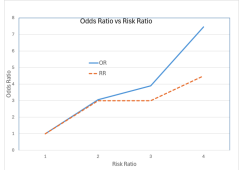
How are Things Being Measured

- SMD = Standardized Mean Difference
 - Cohen's *d* best known
 - $(M1 - M2) / SD$
 - Hedge's *g* typically preferred
- Correlation coefficient (*r*)

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How are Things Being Measured

- Risk Ratio [aka Relative Risk] = Risk of Exposed Group ÷ Risk of Unexposed Group
 - Need comparison group to determine *relative* risk
- Odds Ratio (OR) = Odds of Exposed Group ÷ Odds of Unexposed Group

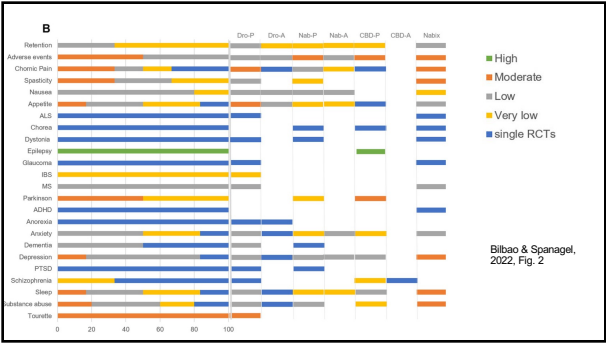


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What Do the Measurements Mean?

Magnitude	Cohen's d	Odds Ratio
Small	0.2	1.0 - 1.49
Medium	0.5	1.5 - 2.99
Large	0.8	> 3.0

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Glaucoma

- THC/CBD do lower intraocular pressure 10-15%
 - BUT only 3-4 hrs
 - CBD may increase pressure
- Lowered BP can damage optic nerve
- American Academy of Ophthalmology, Glaucoma Research Foundation do not recommend

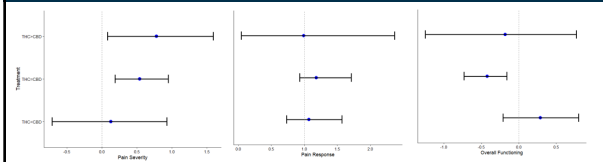
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Nausea/Vomiting

- Some cancer patients use legal/illicit cannabis for chemotherapy-related nausea/vomiting
 - Also for sleep, pain
- Cautions:
 - May slow metabolism of other medications
 - Confusion re purpose of cannabis

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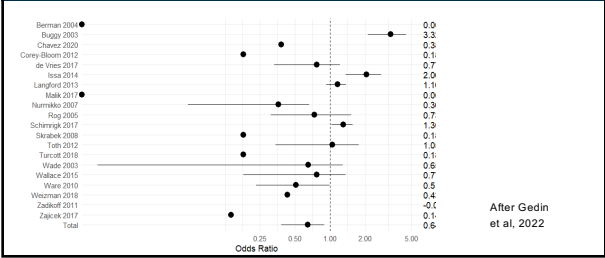
Chronic Pain



After Chou et al, 2026

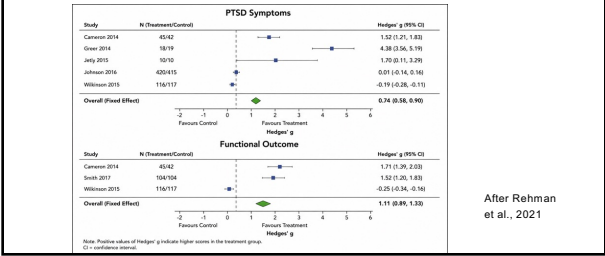
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Response to Placebo in Pain Treatment



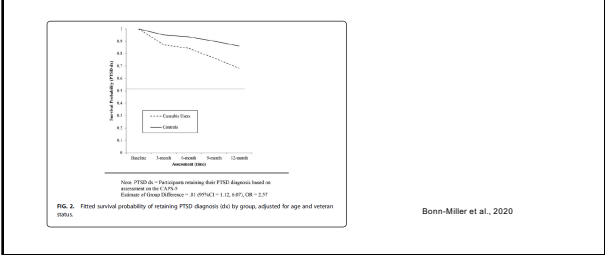
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PTSD



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PTSD & Cannabis Use

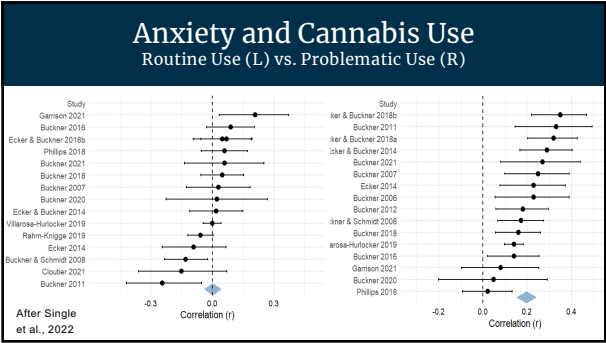


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PTSD & Cannabis Use

- Hicks et al., 2022
 - Reviewed 45 studies, found strong associations between recreational cannabis use and PTSD
 - Postulated both a causative/exacerbating and a "self-medicating" role
- Other recent meta-analyses:
 - Black, et al., 2019 – 1 small study, showed improvement in PTSD outcome with pharmaceutical grade THC:CBD; no data on medical grade THC and outcomes
 - Bilbao & Spanagel, 2022 – 1 small study each with dronabinol and nabilone; yielded SMDs of -0.63 and -0.88, respectively
 - Wilson et al., 2026 – 2 studies, "very low" quality, SMD = -0.16

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Methamphetamine & Psychosis

Causation, Correlation or Risk Factor?

Contributing Risks:

- Age of onset
- Frequency / Quantity
- Co-morbidities

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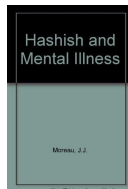
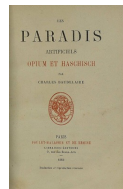
Cannabis and Psychosis

73

Cannabinoids & Psychosis

- Link between cannabis use and psychotic symptoms recognized early in France
 - Jacques-Joseph Moreau, 1845
 - Charles Beaudelaire, 1860

Les Paradis Artificiels: Opium et haschisch



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Cannabinoids & Psychosis

- Link between cannabis use and psychotic symptoms recognized early in France
- Detailed report on "Indian Hemp Insanity" by Indian Hemp Drugs Commission (Ayonrinde, 2019)
 - Reported issues similar to those recognized today
- Historically the issue has been better recognized in Europe than in U.S.
 - 1987 Andreasson et al., RR = 6.0
 - 2002 Zammit et al. (27 yr), aOR = 6.7 (2.1-21.7)
 - 2012 Manrique-Garcia et al. (35 yr), OR = 3.7
- The connection is by now well established

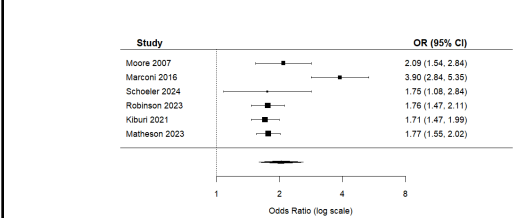
75

Onset Cannabis Use Precedes Psychosis

Bartt et al 2007	CUD ~ 50%, AUD 40-45% of study population at first episode psychosis; 28% used cannabis in 30 days prior to first episode, all other drugs < 10% each
Compton et al 2009	hazard ratios for first episode rise from 1.2 (any cannabis use) to 2.0 (daily use); daily use HR notably higher for women
Kelly et al 2016	Increase to daily use doubled rate of symptom onset w/in 5 yrs
Large et al 2011	age of onset for psychosis 2.7 yrs younger for cannabis users than non-users
Sevy et al 2010	74% CUD subjects had CUD sxs before onset of psychosis
Veen et al 2004	5 yr premorbid mj use increase to <u>daily use = 3.55</u>

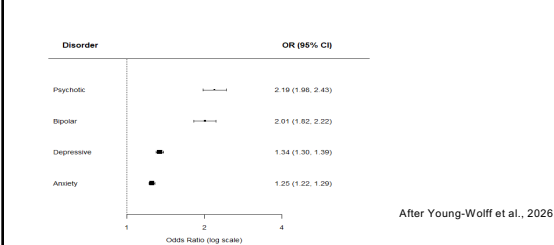
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Cannabinoids & Psychosis



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Adolescent MH Disorders & Cannabis Use



78

Cannabinoids & Psychosis

- Does cannabis use cause psychosis?
 - Some (e.g., Ksir & Hart, have suggested the reverse – psychosis encourages cannabis use
 - Typically framed as self-medication
- BUT...
 - Very consistent findings of strong correlation between cannabis use and psychotic symptoms

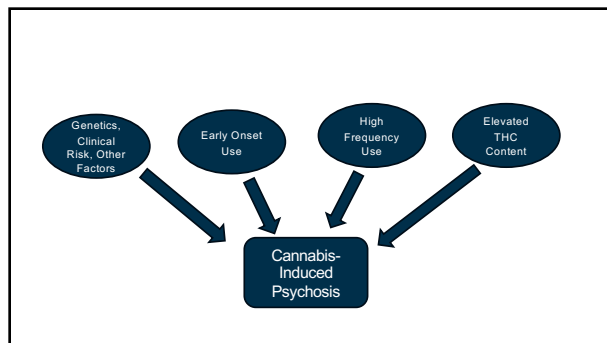


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Cannabinoids & Psychosis

- Does cannabis use cause psychosis?
 - Some (e.g., Ksir & Hart, have suggested the reverse – psychosis encourages cannabis use
 - Typically framed as self-medication
- BUT...
 - Very consistent findings of strong correlation between cannabis use and psychotic symptoms
 - Spinazzola et al 2023, most common reason to start using – engage with friends
 - Very consistent findings of strong dose-response relationship between cannabis and psychotic symptoms
 - Regular cannabis use preceded emergence of psychosis by 6.3 yrs. (Myles, et al., 2016)

80



81

Background Factors

- Family history/Genetics
 - Much greater risk of schizophrenia in individuals with parent who has schizophrenia (e.g., Arendt et al., 2008)
- High Risk/Ultra-High Risk
 - Often considered an important risk factor

82

Background Factors

- Family history/Genetics
 - Much greater risk of schizophrenia in individuals with parent who has schizophrenia (e.g., Arendt et al., 2008)
- High Risk/Ultra-High Risk
 - Often considered an important risk factor

Cannabis Use	Carney et al., 2017	Farris et al, 2020
Current	26.7%	25.8%
Lifetime	52.8%	48.7%
Cannabis Use Disorder	12.8%	14.9%

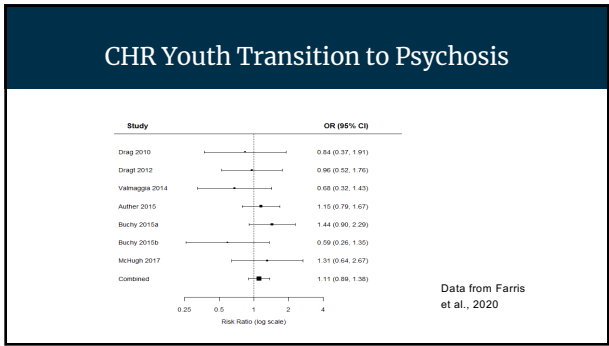
83

Psychotic Symptoms in CHR Individuals

Symptom	k
Total +	8
Disorg Speech	4
Grandiosity	3
Percept Abn	4
Suspicious	3
Unusual Thought	4
Total -	7

Carney et al., 2017

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85

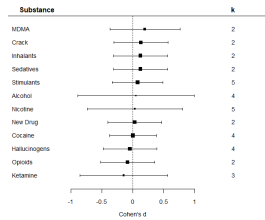
- ### Background Factors
- Family history/Genetics
 - High Risk/Ultra-High Risk
 - Factors common to cannabis use and schizophrenia
 - Trauma (esp. childhood trauma)
 - Urbanicity

86

- ### Background Factors
- Family history/Genetics
 - High Risk/Ultra-High Risk
 - Factors common to cannabis use and schizophrenia
 - Other drug use

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Substances as Predictors of Cannabis Use



Data from Schoeler, et al., 2024

88

Background Factors

- Family history/Genetics
- High Risk/Ultra-High Risk
- Factors common to cannabis use and schizophrenia
- Other drug use
 - **Tobacco**

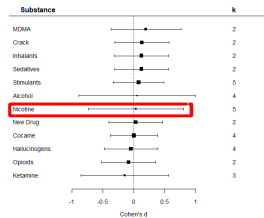
89

Tobacco, Cannabis, & Psychosis

- Per National Institute on Drug Abuse, 50-75% overlap in cannabis/tobacco users
- Myles et al., 2012 – 59% of first episode psychosis patients were smokers
 - In first episode individuals, OR psychosis = 6.04 vs. non-smoking controls
- Gurillo et al., 2015 - 57% of first episode psychosis patients were smokers
 - OR smoking = 3.22 vs. non-smokers
 - Daily smokers experienced first episode break ca. 4 yrs. earlier than non-smokers

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Substances as Predictors of Cannabis Use



Data from Schoeler, et al., 2024

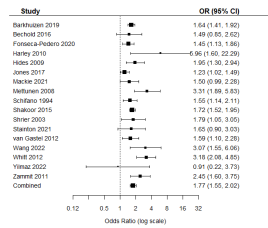
91

Early Onset Cannabis Use & Psychosis

- Early Onset Cannabis Use
 - Dunedin study – 4.5 OR psychosis with first use prior to age15
 - OR drops to 1.65 if onset after 18 (Arseneault, et al., 2002)

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Psychotic-Like Experiences in Youth

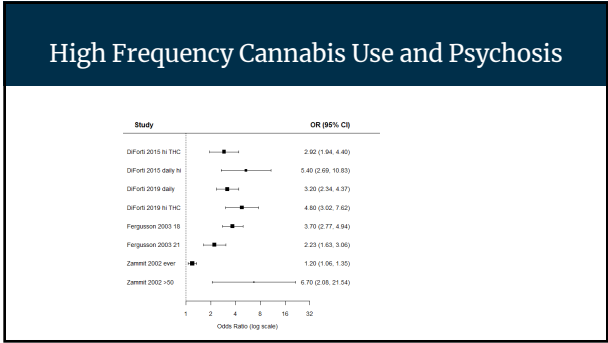


Data from Matheson et al., 2023

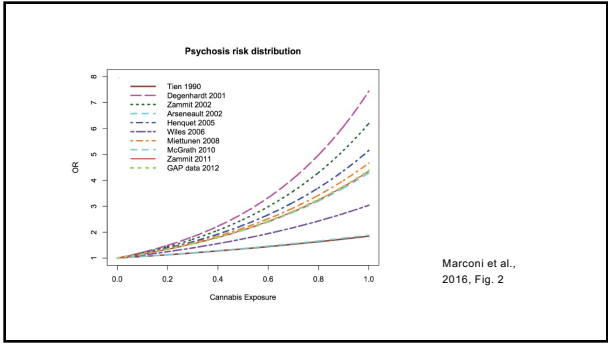
93

Early Onset Cannabis Use & Psychosis		
Study	Yrs. @ Follow-up	OR
	Yrs	OR
Ferdinand 2005	14	2.81
Kuepper 2011	3.5	1.9
	8.4	2.2
Schubart 2011 pos sx	9.6	3.1
neg sx		1.7
heavy use - pos sx		3
heavy use - neg sx		3.4

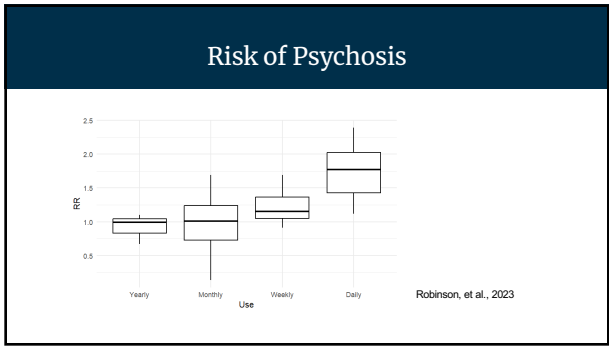
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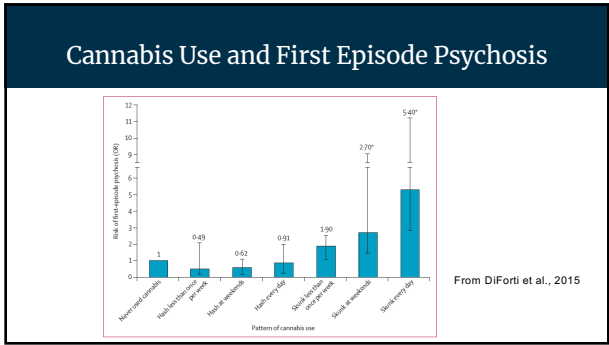
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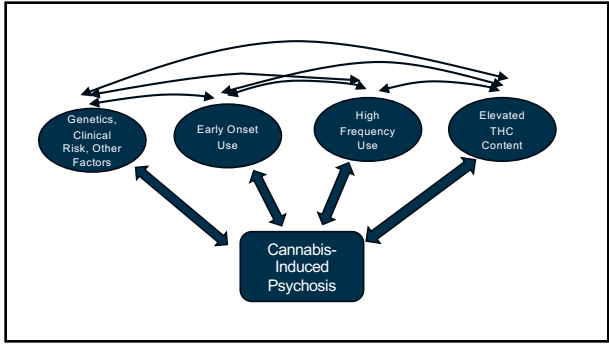
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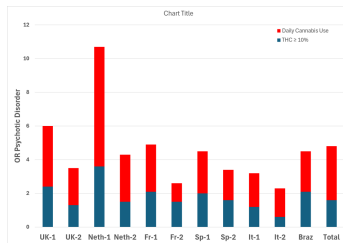
High THC Content Cannabis

	Di Forti, et al., 2009		Di Forti, et al., 2015		Di Forti, et al., 2019	
Duration use	> 5 yrs	2.1			Lifetime	1.3
Freq. use	Daily	6.4	Weekly	3.04	> x1/week	1.4
			Daily	1.04	Daily	3.2
High THC		6.8	"Hash-like"	0.83	Low potency	1.1
			"Skunk-like"	2.91	High potency	1.6

Odds Ratios vs. lowest category

100

High THC Content Cannabis



Data from Di Forti et al., 2019

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The Bottom Line

- Any combination of these factors in cannabis use adds to likelihood of developing a cannabis-related psychotic condition
 - Starting to use by age 15
 - Using daily/near daily
 - Routinely using products with high THC content
- Therefore – important to inquire about these variables in interview
 - Maybe tobacco, too

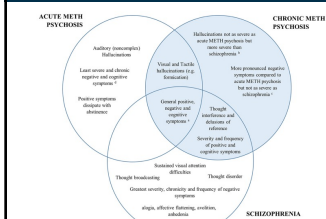
102

The Bottom Line

- Any combination of these factors in cannabis use adds to likelihood of developing a cannabis-related psychotic condition
 - Starting to use by age 15
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 - Routinely using products with high THC content
- Therefore – important to inquire about these variables in interview
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Drug vs. Non-Drug Psychosis



Wearne and Cornish (2018), Figure 1

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Legal Implications

Meth & Violence

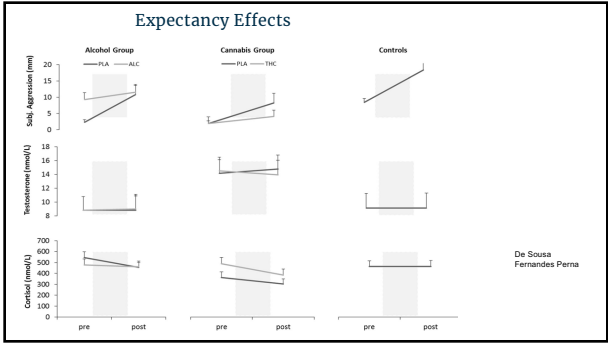
Cannabis and Violence

105

Crime and Violence

- A topic of considerable public debate – fraught with emotions and politics

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Crime and Violence

- NZ Drug Harm Index

Drug type	Personal harm \$ per kilogram	Community harm \$ per kilogram	Total harm \$ per kilogram
Methamphetamine	544,451.68	563,910.03	1,108,361.71
Cocaine	125,917.23	173,755.03	299,672.26
MDMA	62,283.36	76,455.46	138,738.82
Cannabis	4,847.90	10,876.13	15,724.02

Table 2. Estimated annual consumption of illicit drugs in New Zealand 2019¹

Drug type	Total consumption (kg)
Methamphetamine	743
Cocaine	51
MDMA	378
Cannabis	58,000

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Crime and Violence

- NZ Drug Harm Index

Summary of social harms by drug type (\$ million)

Drug type	Personal harm \$ million	Community harm \$ million	Total harm \$ million
Methamphetamine	404.52	418.98	823.50
Cocaine	6.44	8.89	15.33
MDMA	23.53	28.88	52.42
Heroin	18.16	*	18.16
GHB/GBL	1.13	1.93	3.06
Cannabis	280.97	630.34	911.31
Synthetic cannabinoids	78.35	2.13	80.47
Total	813.09	1091.15	1,904.25

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Crime and Violence

- NZ Drug Harm Index

Table 3. Personal harms by drug type (\$ million)¹⁰

Drug type	Premature death	Quality of life		Total harm
		Serious injury	Minor injury	
Methamphetamine	244.85	151.57	8.10	404.52
Cocaine	4.53	1.58	0.33	6.44
MDMA	15.85	5.37	2.32	23.53
Heroin	18.11	0.00	0.05	18.16
GHB/GBL	0.00	0.83	0.30	1.13
Cannabis	124.50	148.96	7.51	280.97
Synthetic cannabinoids	76.96	0.91	0.48	78.35
Total	484.80	309.21	19.08	813.09

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Crime and Violence

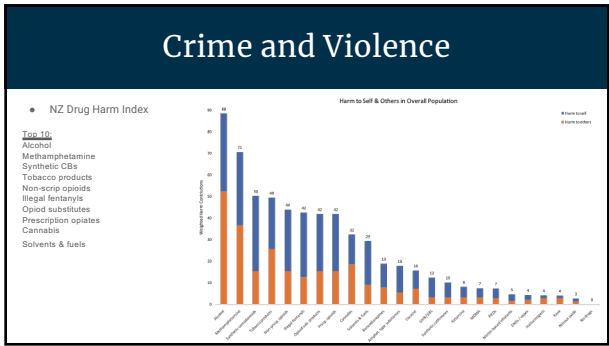
- NZ Drug Harm Index

Table 4. Community harms by drug type (\$ million)¹⁰

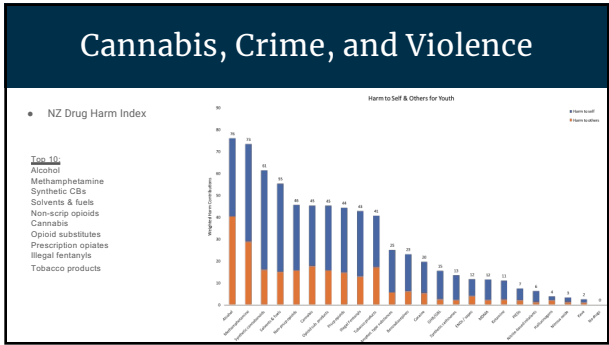
Drug type	Harm to family and friends	Acquisitive crime	Reinvestment in other crime	Tax revenue foregone	Total harm
Methamphetamine	254.27	100.51	13.08	51.12	418.98
Cocaine	2.66	1.05	1.06	4.13	8.89
MDMA	9.00	3.56	3.32	13.00	28.88
Heroin	*	*	*	*	*
GHB/GBL	1.39	0.55	*	*	1.93
Cannabis	249.89	98.78	57.38	224.29	630.34
Synthetic cannabinoids	1.52	0.60	*	*	2.13
Total	518.74	205.05	74.83	292.53	1091.15

* Insufficient data for an estimate to be made.

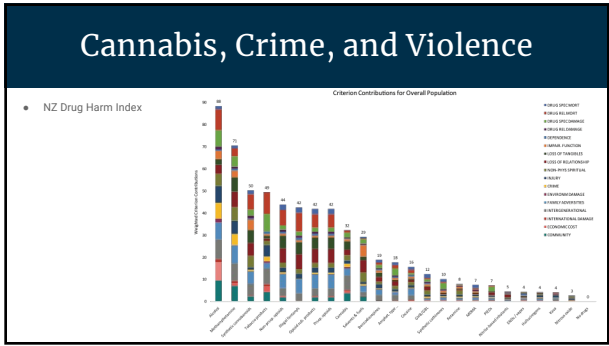
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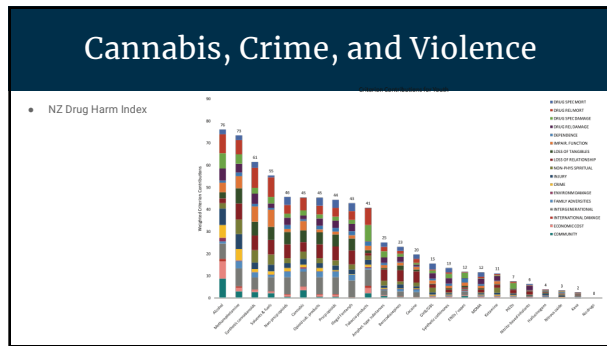
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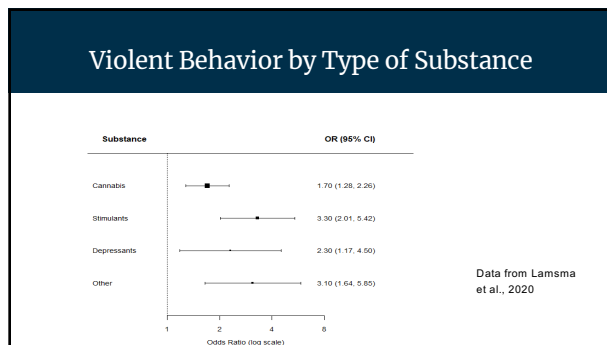
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116

Cannabis and Violence

- Numerous studies in various contexts
 - Majority significantly flawed
 - Few control for other drug use (esp. alcohol, psychostimulants)
- Of 51 studies reviewed, 7 addressed other drug use

117

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- Of 51 studies reviewed, 7 addressed other drug use

So What?!?

118

Cannabis and Violence

So What?!?

- Arseneault, 2000 – OR w/both alcohol and cannabis dependence = 18.4
 - = 6.8 for any cannabis use
 - = 2.3 after alcohol dependence included as covariate
- Koen, 2004 – OR = 6.89
 - = 1.28 when controlled for alcohol

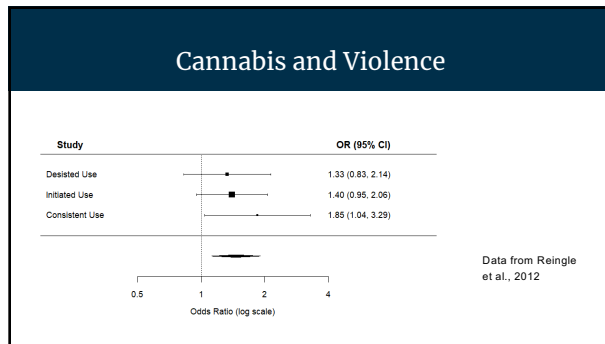
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Cannabis and Violence

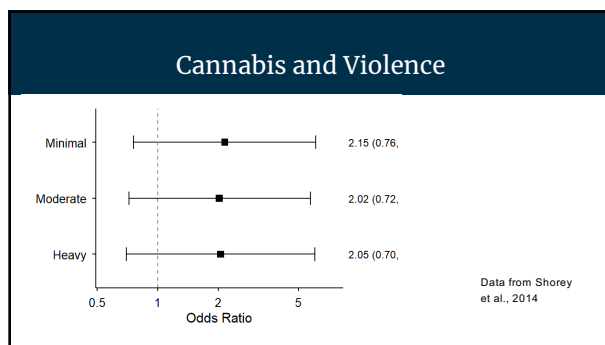
Study	OR (95% CI)
Arseneault 2002	2.30 (1.12, 4.70)
Koen 2004	1.32 (0.47, 3.70)
Moulin 2018	5.45 (2.93, 10.14)
Schoeller 2020	1.08 (1.02, 1.14)
Smith 2013	1.59 (1.14, 2.22)

Odds Ratio (log scale)

120



121



122

- ### Cannabis and Violence
- Numerous studies in various contexts
 - Majority significantly flawed
 - Few control for other drug use (esp. alcohol, psychostimulants)
 - Of 51 studies reviewed, 7 addressed other drug use
 - Note several addressing cannabis use in context of
 - Interpersonal violence (esp. dating violence)
 - Violent behavior during withdrawal

123

Psycholegal Issues, Formulations, and Cases

124

Competency to Stand Trial

aka, Competency to Proceed
aka, Fitness to Proceed

125

Competence to Proceed/Stand Trial

- Rarely an issue...
 - Except in cases of persisting psychosis

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Competence to Proceed/Stand Trial

- Rarely an issue...
- At least a few Colorado cases involve ongoing psychosis as a barrier to competence
 - Defendants on bond, receiving outpatient restoration treatment
 - Also likely ongoing substance use, esp. cannabis
 - Evaluators opine unrestorable within statutory time frames unless psychosis abates (i.e., even if maintained/exacerbated by substance use)

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Criminal Responsibility

aka, Sanity
aka, Mental State at the Time of the
Offense

128

Intoxication

"disturbance of mental or physical capacities resulting from the introduction of any substance into the body"

People v. Low (Colo., 1987)

Spoiler Alert...

129

Intoxication

"disturbance of mental or physical capacities resulting from the introduction of any substance into the body"

People v. Low (Colo., 1987)

Spoiler Alert...

Courts are often unforgiving toward substance abusing defendants, and rarely allow evidence of impairment stemming from acute intoxication to be used as a defense

130

Three Questions with Intoxication Cases

- Voluntary or involuntary ingestion of substance(s)

131

Commonwealth v. Aldo Dunspe, 485 Mass. 871

- Admitted for inpatient psychiatric treatment in late 2013 after exhibiting severe paranoid delusions, ideas of reference, hallucinations
- Had used cannabis heavily on a daily basis for several years prior to admission
 - No access while hospitalized
- 4 days into admission, assaulted and killed roommate
- Entered insanity plea
 - Defense expert diagnosed schizophrenia
 - Thought victim was threatening him
 - Prosecution expert diagnosed cannabis withdrawal causing psychotic symptoms

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Cannabis Withdrawal – DSM-5

- Cessation of cannabis use that has been heavy and prolonged...
- Three or more of the following within approximately one week [of cessation of use]
 - Irritability, anger, or aggression
 - Nervousness or anxiety
 - Sleep difficulty (e.g., insomnia, disturbing dreams)
 - Decreased appetite or weight loss
 - Restlessness
 - Depressed mood
- At least one of the following physical symptoms causing significant discomfort: abdominal pain, shakiness/tremors, sweating, fever, chills, or headache.

133

Commonwealth v. Aldo Dunphe, 485 Mass. 871

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 - No access while hospitalized
- 4 days into admission, assaulted and killed roommate
- Entered insanity plea
 - Defense expert diagnosed schizophrenia
 - Thought victim was threatening him
 - Prosecution expert diagnosed cannabis withdrawal causing psychotic symptoms
- Found guilty at trial

134

Commonwealth v. Aldo Dunphe, 485 Mass. 871

- Appealed based on jury instructions:
 - Where a defendant lacked substantial capacity to appreciate the criminality or wrongfulness of his conduct or to conform his conduct to the law solely as a result of voluntary intoxication, then he is criminally responsible for his conduct.
- Supreme Judicial Court agreed instructions could have misled jurors – conviction vacated
- Took plea offer to avoid retrial

135

People v. Mion (Colo. Supreme Court, 2026)

- Isaac Uranus Mion charged with Aggravated Robbery, Criminal Mischief, Felony Menacing summer 2019
 - Altercation with security guard after found sleeping on City and County Municipal Building
 - Brandished screwdriver, damaged cell phone, arrested in South Platte River
 - Smoked joint with acquaintance, then engaged in allegedly highly atypical behavior
- Found guilty at trial
 - Judge denied defense attempt to argue involuntary intoxication

136

People v. Mion (Colo. Supreme Court, 2026)

- Isaac Uranus Mion charged with Aggravated Robbery, Criminal Mischief, Felony Menacing summer 2019
- Found guilty at trial
- Court of Appeals reversed, in 2023, accepted argument Mion had involuntarily ingested another substance that caused intoxication and erratic behavior
- Supreme Court reversed again - "caused by substances which the defendant knows or ought to know have the tendency to cause intoxication and which he knowingly introduced . . . into his body."

137

Three Questions with Intoxication Cases

- Voluntary or involuntary ingestion of substance(s)
- Nature of offense –
 - General vs. specific intent

138

General and Specific Intent

The terms "specific intent" and "general intent" are the bane of criminal law students and lawyers.
Dressler, 2022

The terms "specific intent" and "general intent" are riddled with confusion that has persisted in federal courts and academia.
Cheian, 2025

This is an exceedingly confusing common law distinction that cannot be simply explained.
Goldstein, Morse, & Packer, 2013

139

General and Specific Intent

- General Intent – considers act itself
 - Rape – engaging in sexual activity without other person's consent
- Specific intent – considers act plus an additional intent
 - Burglary with intent to sexually assault – with intent is additional component
- Voluntary intoxication is not a defense to general intent crimes
 - Sometimes it is for specific intent crimes

140

Montana v. Egelhoff (1996)

- Charged with deliberate homicide (two counts)
- Prevented from arguing extreme intoxication precluded ability to form requisite mental state (i.e., mens rea)
- Convicted
- Montana Supreme Court reversed – defendant has right to present all relevant evidence
- SCOTUS reversed – defendant does not have constitutional right to present voluntary intoxication evidence to negate requisite mental state in murder case
 - 5-4 decision
 - Ginsburg concurred with Scalia but gave different reasoning

141

Montana v. Egelhoff (1996)

- Did not preclude states from allowing such evidence
- Several states prohibit or substantially limit use of voluntary intoxication evidence

142

When Can Voluntary Intoxication be Used as a Defense?

- Settled/fixed insanity

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Fixed and Settled Insanity

- Often used synonymously
 - Fixed – permanent damage impairing functional abilities, often (usually?) caused by substance use
 - Settled – impairing psychosis triggered/exacerbated by substance use and persisting well beyond period of intoxication
- Considered grounds for complete defense in many (29) jurisdictions
 - *Bieber v. People* (1993) – contrasts individual using and knowing they will be “momentarily ‘mentally defective’” vs. knowing they may be so “as an eventual long-term result.” **In both cases the person is aware of the possible consequences of his or her actions.**

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Fixed and Settled Insanity

States not recognizing settled insanity:

Arizona	Arkansas	Colorado	Connecticut
Delaware	Georgia	Idaho	Kansas
Montana		Utah	

States yet to address the issue:

Kentucky	Maine	Minnesota	Mississippi
New Mexico	North Carolina	North Dakota	Pennsylvania
Rhode Island	West Virginia	Wyoming	

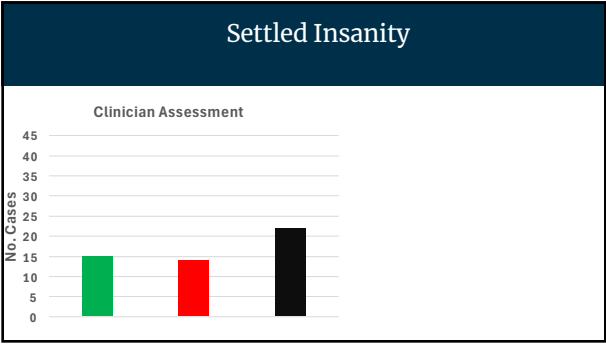
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Methamphetamine and Settled Insanity

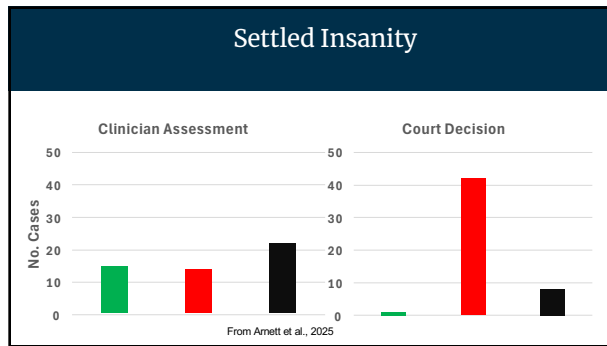
- Engelson et al. 2025 –
 - Very few settled insanity cases involving methamphetamine
 - Lack of diagnostic clarity
 - Obscures debilitating mental health condition and perhaps overemphasizes substance use

Striking... is the level of stinginess of most states in the excuses and mitigations they offer. *- Robinson 2014*

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148

Three Questions with Intoxication Cases

- Voluntary or involuntary ingestion of substance(s)
- Nature of offense –
 - General vs. specific intent
- Impact of intoxication on culpability

149

When Can Voluntary Intoxication be Used as a Defense?

- Settled/fixed insanity
- Negate mens rea

150

Mens rea

- Criminal offense has two components:
Actus rea + Mens rea
- "Guilty mind"
 - Culpable mental state
- Crime, as a compound concept, generally constituted... from *concurrence of an evil-meaning mind with an evil-doing hand*
- Morissette v. U.S., 1952

151

Model Penal Code

- Culpable mental states
 - Purposely – acting with conscious objective to attain specific goal or result
 - Knowingly – aware of nature of one's conduct; almost certain a specific result will occur
 - Recklessly – disregarding substantial and unjustifiable risk
 - Negligently – unaware of substantial and unjustifiable risk, but should have been

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Model Penal Code

- Culpable mental states
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 - Knowingly – aware of nature of one's conduct; almost certain a specific result will occur
 - Recklessly – disregarding substantial and unjustifiable risk
 - Negligently – unaware of substantial and unjustifiable risk, but should have been
- Colorado's version

Intentionally, with intent	=	Purposely
Knowingly, willfully	=	Knowingly
Recklessly	=	Recklessly
Negligently	=	Voluntarily

153

General/Specific Intent & Model Penal Code

	Colorado	Cheian
Purposely/Intentionally	Specific Intent	Specific Intent
Knowingly	General Intent	
Recklessly		
Voluntarily/Negligently		

154

People v. Richard Kirk

- Spring 2014 wife calls 911, reports husband had eaten marijuana gummy, became erratic, was retrieving handgun
- 13 minute conversation ended with sound of gunshot
- Kirk found running through neighborhood, 1/2 of gummy found at their home
- He was mid-40s, no psychiatric history, dependent on opiate analgesics for back pain
- Couple also had financial problems, had been fighting a lot
- Diagnosed with cannabis-intoxication delirium

Left open multiple possibilities



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The Rest of the Kirk Story

- Various defense options:
 - A complete defense – delirium left him incapable of controlling his behavior
 - NGRI – mental disease or defect (delirium) left him unable to distinguish right from wrong
 - Delirium prevented him from forming culpable mental state
 - Mens rea



156

The Rest of the Kirk Story

- Various defense options:
 - A complete defense – delirium left him incapable of controlling his behavior
 - NGRI – mental disease or defect (delirium) left him unable to distinguish right from wrong
 - Delirium prevented him from forming culpable mental state
 - Mens rea
- But he pled out...



157

Brian Washington

- Late 20s
- Lower middle class upbringing in reasonably stable family
- Dropped out 10th grade, several unskilled/semi-skilled jobs
- IQ measured in low average range
- Adolescent onset substance use (alcohol, hallucinogens, and esp. marijuana)
- Related legal problems, incl. ca. 2 yrs. in CDOC + substance-related parole violation
- Wife(?) died 04/2006 – reportedly became quite depressed
 - No history MH concerns, incl. in CDOC
- Had also begun smoking “wet” (aka “fry,” “Sherm.”)



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Brian Washington

- By 07/2006, was wandering streets
 - Rambling speech, including assertions that he was “Son of God”
- 09/18/2006, fired shots at woman apparently unknown to him
- 09/22/2016, pointed gun at vehicle at stoplight – “I’ve got you, I told you I’d get you”
 - Shot and killed off-duty detective in personal vehicle
 - Subdued by several people
 - First officer to contact him described him as “acting crazy, not making sense”
 - Weeks later told mother during jail phone call he thought police were following him due to child custody issue



159

Brian Washington

- Charged with Murder 1

§18-3-103

(1) A person commits the crime of murder in the first degree if:

(a) After deliberation and *with the intent* to cause the death of a person other than himself, he causes the death of that person or of another person; or...

(d) Under circumstances evidencing an **attitude of universal malice** manifesting **extreme indifference** to the value of human life generally, he knowingly engages in conduct which creates a grave risk of death to a person, or persons, other than himself, and thereby causes the death of another

- Entered plea of NGRI



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Colorado Revised Statutes

§18-3-103

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§18-3-104

(1) A person commits the crime of murder in the second degree if:

(a) The person **knowingly** causes the death of a person

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Brian Washington

- Charged with Murder 1
 - With intent*****
- Entered plea of NGRI
- At trial, attorneys argued inability to form culpable mental state of "with intent"
 - Therefore rejected charge of Murder 1, but convicted on Murder 2

An example of how diminished capacity works



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Diminished Capacity

- A partial defense
 - Accommodated in some jurisdictions, but not all
 - Not included in Colorado sanity statute
 - Well developed in California esp. in 1970s
 - Usually applied in attempt to reduce Murder to Manslaughter
 - Abandoned by early 1970

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Brian Washington

- Charged with Murder 1
 - With intent*****
- Entered plea of NGRI
- At trial, attorneys argued inability to form culpable mental state of "with intent"
 - Therefore rejected charge of Murder 1, but convicted on Murder 2
 - It ultimately made little difference - had been previously sentenced to 26 years (firing gun at woman)
 - Had been sentenced to 26 yrs. for shooting at woman
 - Judge gave him 80 yrs. for detective's death, *consecutively*



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And finally...



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Clifford Bishop

- Began drinking, using marijuana at around 14
- Stopped marijuana, increased drinking while playing tennis in college and later, teaching professionally
- Mid-30s, health deteriorated badly – cirrhotic liver, liver failure
- Parents brought him to their home to await possible liver transplant

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Clifford Bishop

- Began drinking, using marijuana at around 14
- Stopped marijuana, increased drinking while playing tennis in college and later, teaching professionally
- Mid-30s, health deteriorated badly – cirrhotic liver, liver failure
- Parents brought him to their home to await possible liver transplant
 - But his condition improved without the transplant
- Returned to using marijuana at some point several months prior to instant event

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Clifford Bishop

- Thanksgiving 2015, he had been quite reclusive for several days, not even emerging for meals
 - Unbeknownst to parents – sending younger brother out to get marijuana and THC concentrate ("shatter," "ear wax")
- Father sends brother upstairs to defendant's room, defendant doesn't open door, refuses to join family for meal
- Father then goes up to room, instructs defendant to come down to eat, at which point two shots are fired through the door, one of which grazes the top of F's skull

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Clifford Bishop

- Police summoned, barricaded for a time, then came out
- Arrested and charged w/Att Murder
- On evaluation, tells me he had little/no experience w/concentrates
- Also describes psychotic symptoms (auditory and visual hallucinations, paranoid and disorganized thinking)
 - Father, brother confirm odd/nonsensical verbalizations from him in couple of days leading up to event

169

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 - Father, brother confirm odd/nonsensical verbalizations from him in couple of days leading up to event
- Involuntary intoxication?

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Clifford Bishop

- Involuntary intoxication?
- On second interview, reveals:
 - Had been using concentrates for several days
 - Had experienced hallucinations before – multiple occasions
 - *He knew if he stopped using the symptoms would disappear, and he kept using anyway*



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Closing Comments and Questions



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