The Downside of Methamphetamine

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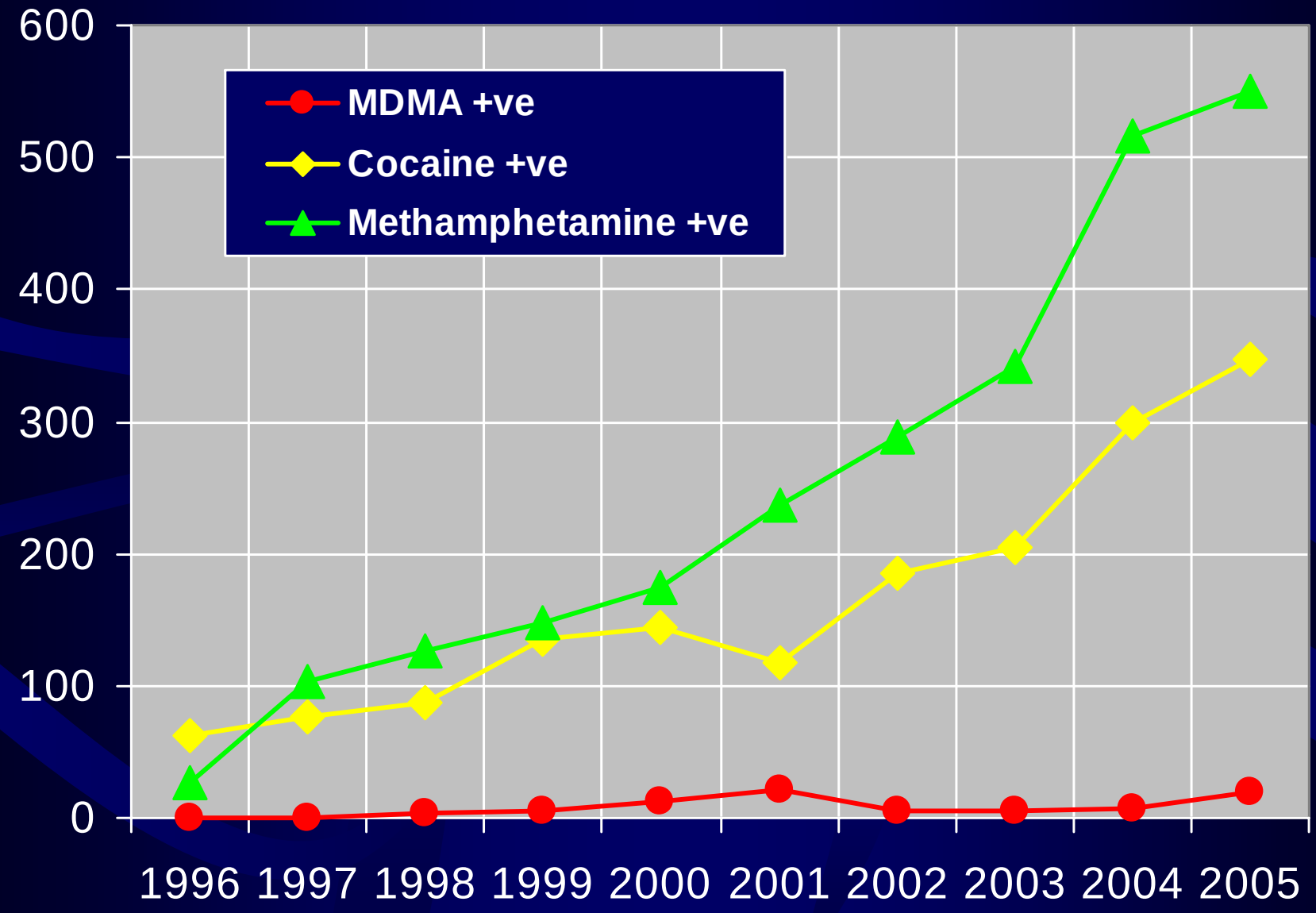
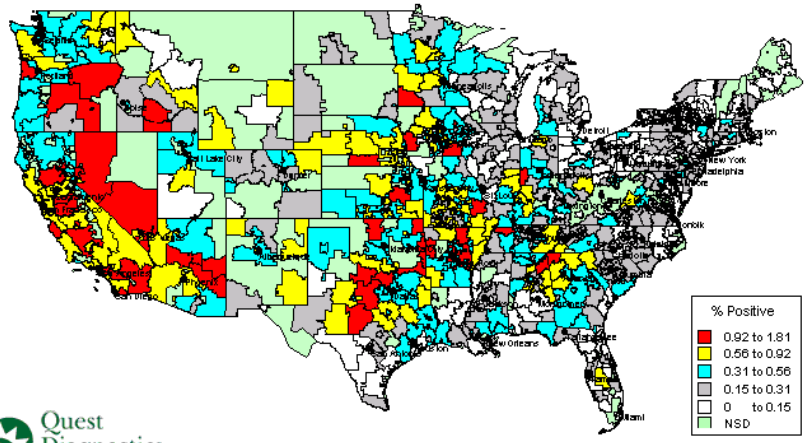
DUID Stimulants (WA)



Amphetamine Positivity by 3-Digit Zipcode

January - December 2002



Quest Diagnostics

Amphetamine Positivity by 3-Digit Zipcode

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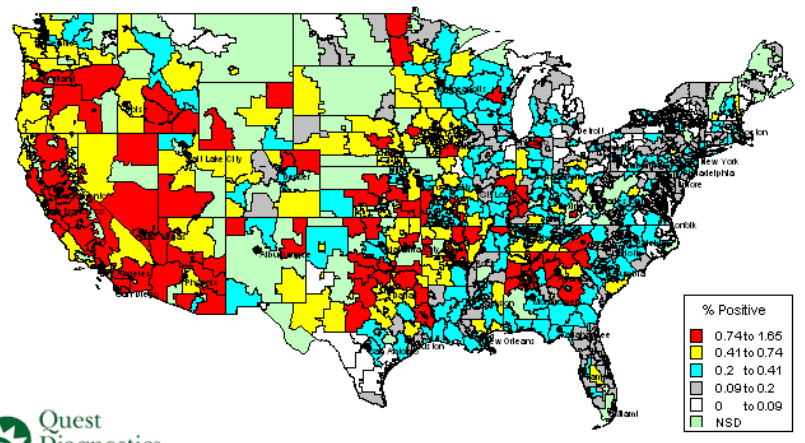

Quest Diagnostics

Amphetamines Positivity by 3-Digit Zipcode

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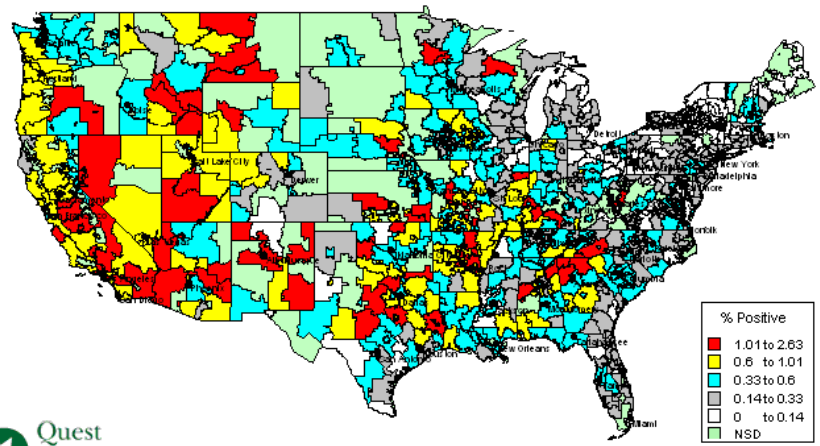

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Amphetamines Positivity by 3-Digit Zipcode

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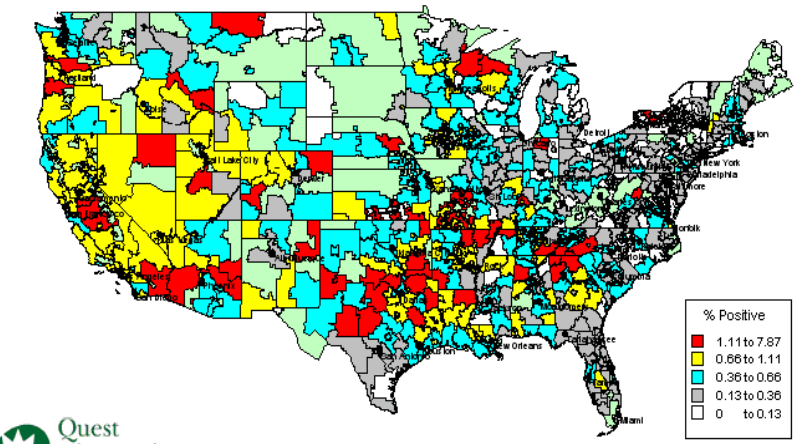

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Amphetamines Positivity by 3-Digit Zipcode

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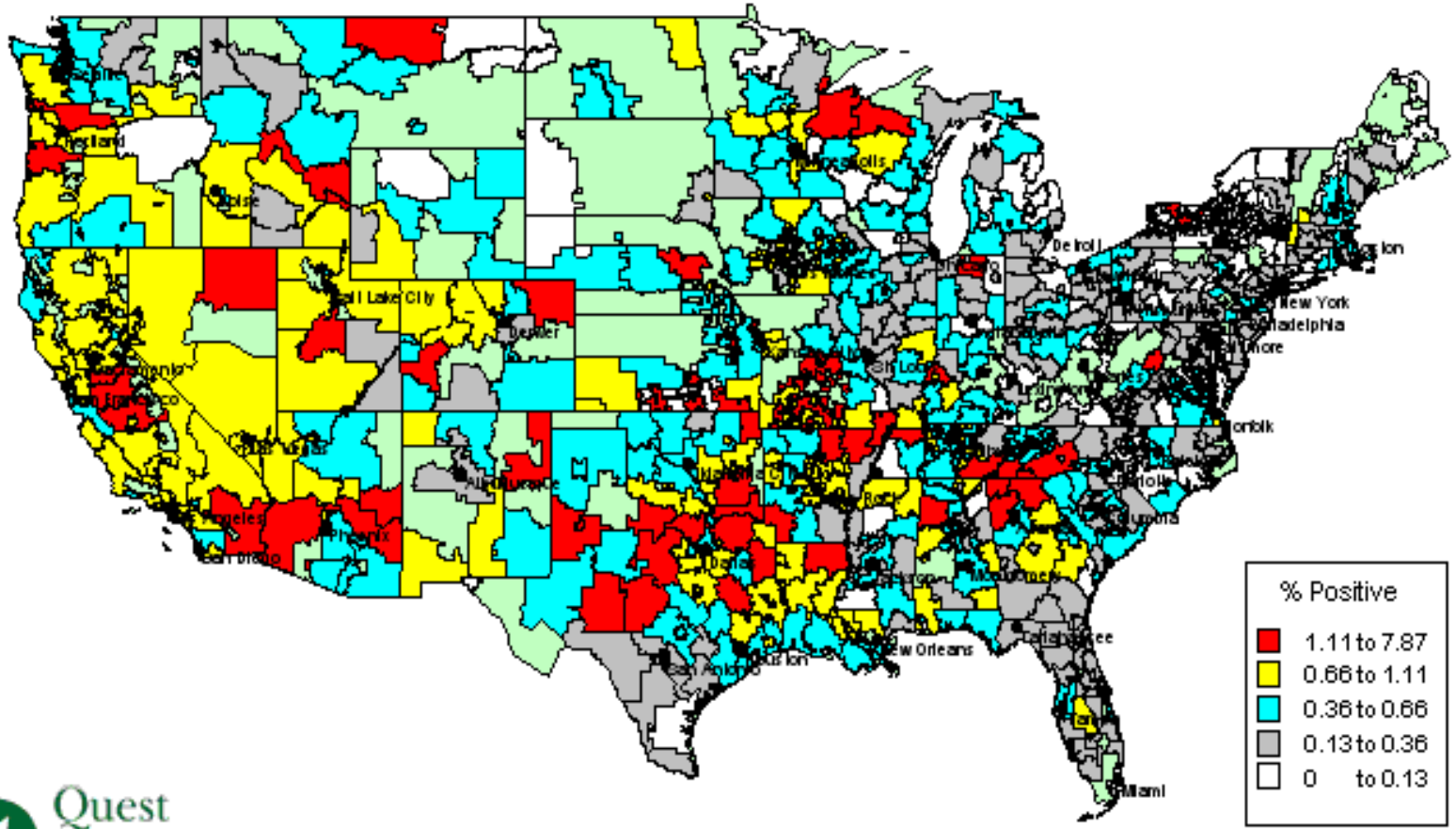

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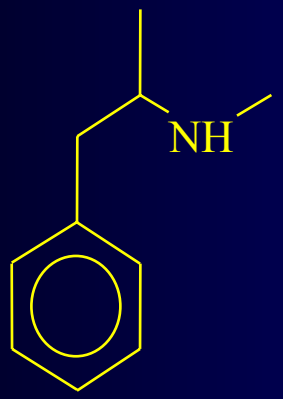
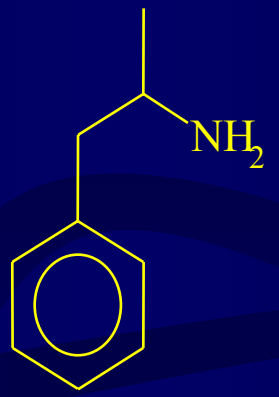
Chemistry

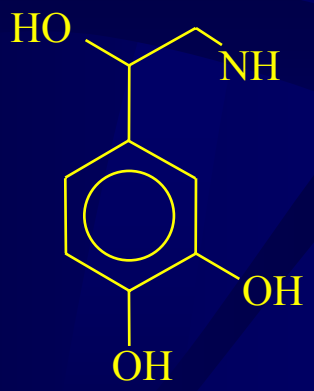


Methamphetamine

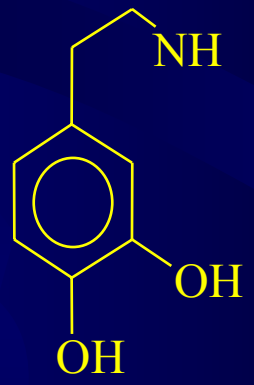


Amphetamine

3,4 MDMA



Norepinephrine



Dopamine

Pharmacology

Peripheral effects

- α and β adrenergic agonist effects
  - pupillary dilation
  - bronchial muscle dilation
  - vasoconstriction
  - coronary dilatation
  - bladder contraction
  - increased heart rate/blood pressure
  - effects on sexual function

Pharmacology - Amphetamines

CNS - Sympathomimetic

promotes synthesis and release of:

Norepinephrine

alerting, anorectic, locomotor effects

Dopamine

locomotor stimulating effects

psychosis, disturbances in perception

5-HT

delusions, psychosis

Methamphetamine

Advances in Pharmacology

Administration of methamphetamine causes long term changes in dopaminergic systems, including decreases in transporter numbers, dopamine concentrations and tyrosine hydroxylase activity.

Dopamine transporter activity is rapidly and reversibly decreased after single use.

Dopamine transporter activity recovers after 24 hours in chronic use, but declines again 8 days post use.

Woolverton et al. Brain Res. 1989;486:73-78
Fleckenstein et al. J Pharm Exp Ther 1997;282(2):834-838

Methamphetamine

Advances in Pharmacology

Methamphetamine concentrations in the brain are eight-fold higher than in the serum during the first hour following IV administration.

In tolerant subjects, serum levels are higher, while brain levels are lower.

Riviere et al. J Pharm Exp Ther 2000;292(3):1042-1047
Gygi et al Neuropharmacology. 1996 Jun;35(6):751-757

Patterns of Use

Clinical use (Desoxyn®):

5 - 60mg (q.i.d.) orally – narcolepsy

2.5 – 40mg (Ext. Rel.) - ADHD

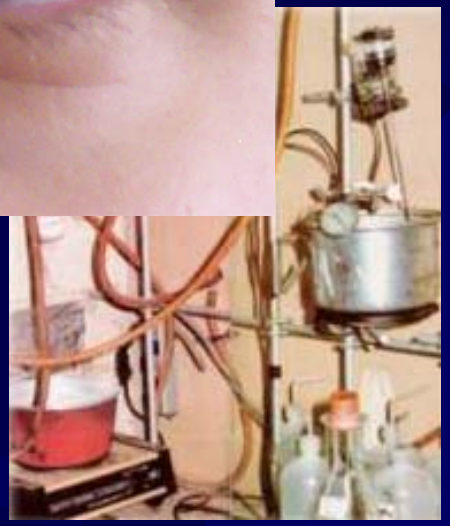
Abuse:

Occasional users – ±60mg

Heavy users 250 - >5000mg/day,

Orally, IV, IN, IM, smoked

Methamphetamine



Crank, Crystal, Speed, Meth

Potent CNS stimulant

Euphoria

Excitation

Alertness

Agitation

Motor restlessness

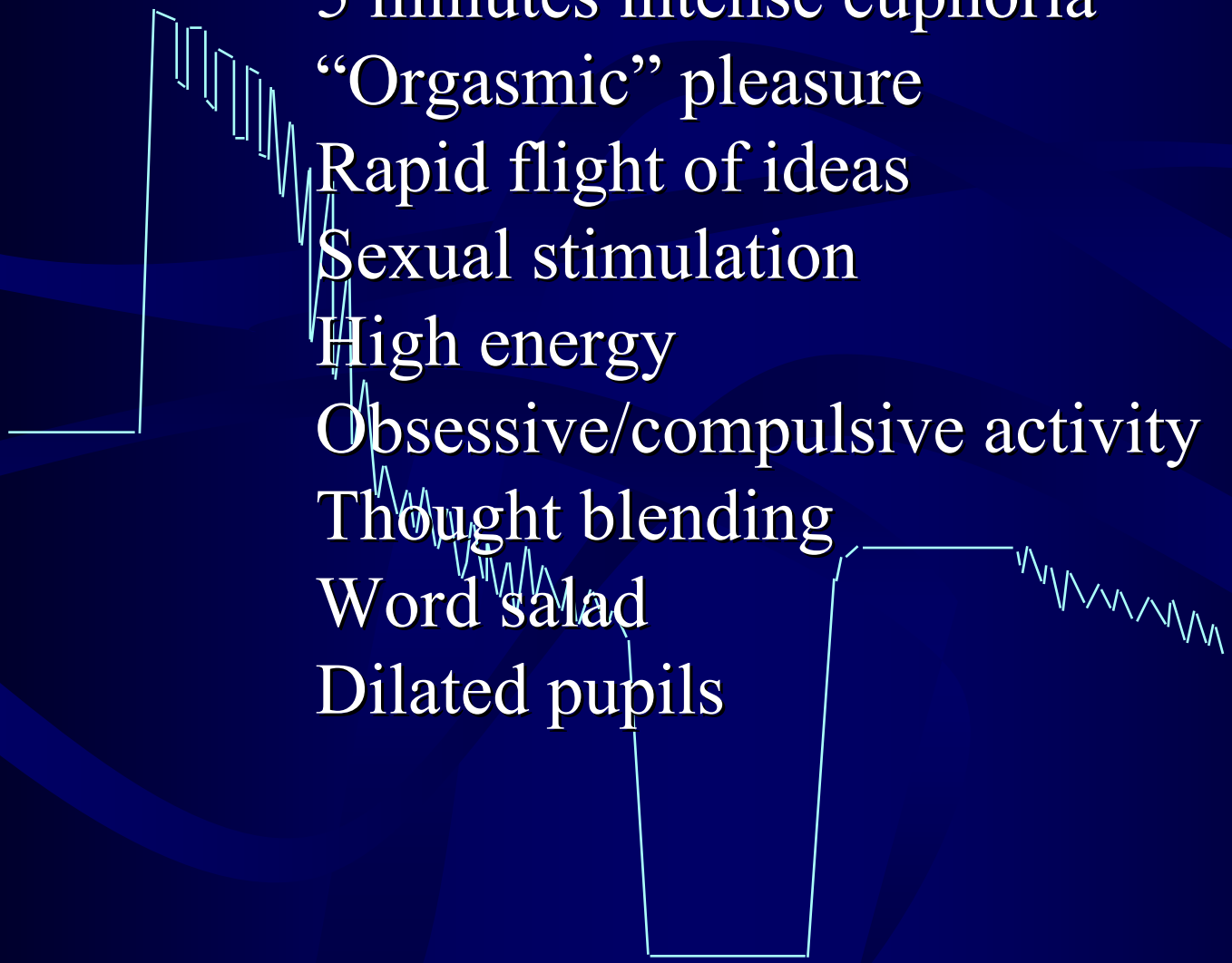
Pharmacodynamics

The methamphetamine binge

- Characterized by high dose, often IV use
- Little or no sleep, no appetite
- Use is compulsive and uncontrolled
- Repeated administration at 1 - 5 hourly intervals
- Binge can persist for days or weeks

Methamphetamine Intoxication

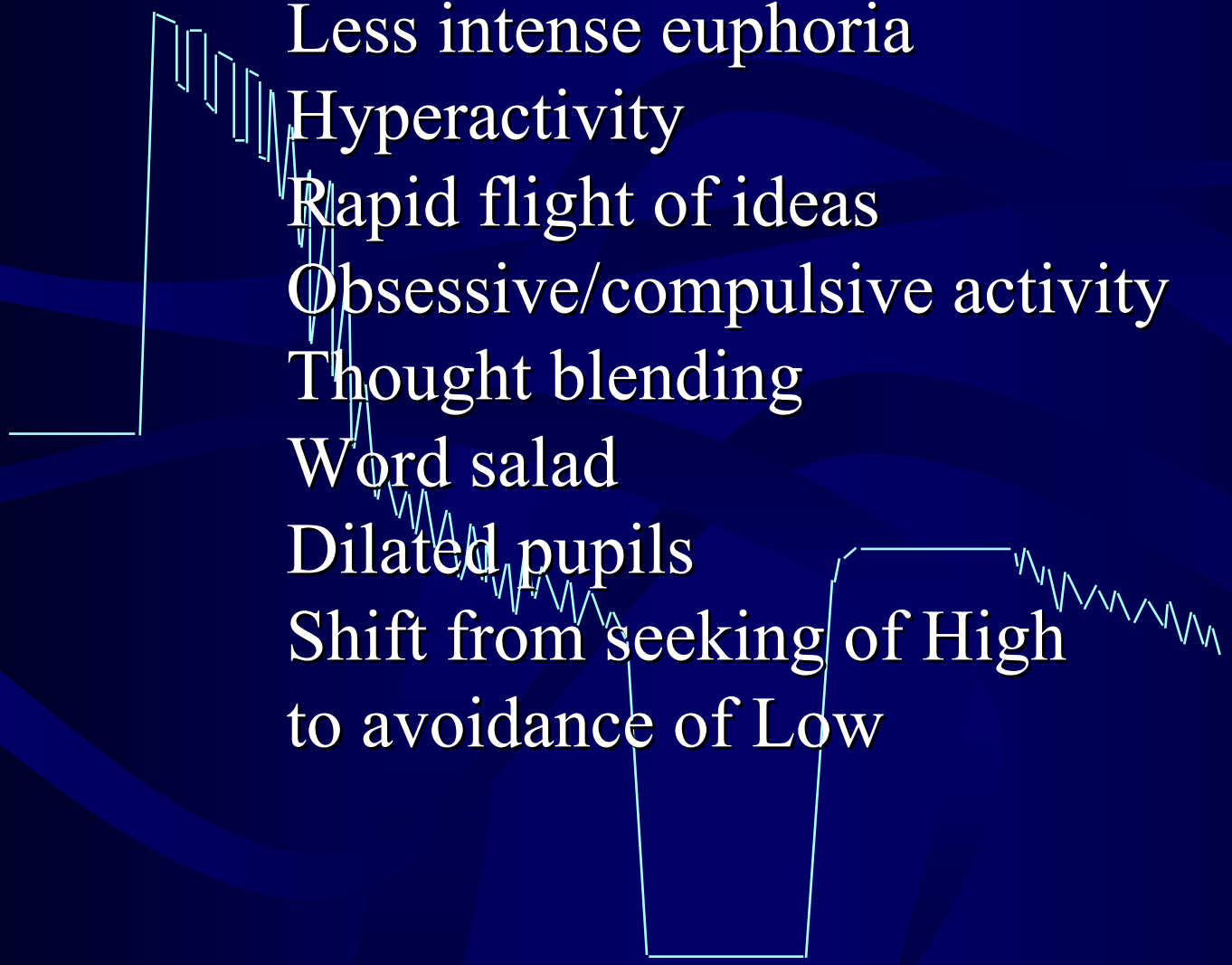
The Rush:



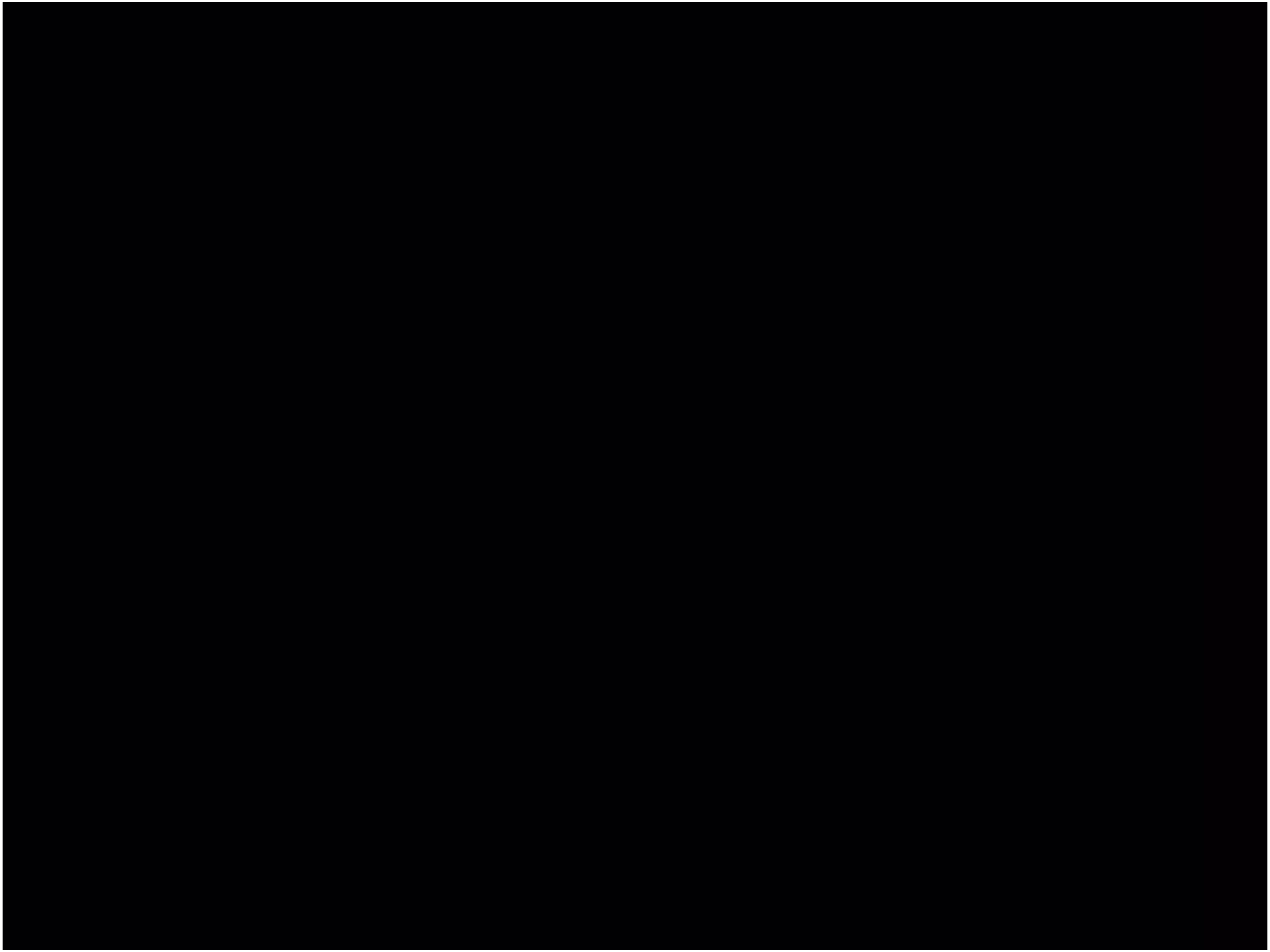
5 minutes intense euphoria
"Orgasmic" pleasure
Rapid flight of ideas
Sexual stimulation
High energy
Obsessive/compulsive activity
Thought blending
Word salad
Dilated pupils

Methamphetamine Intoxication

The Shoulder:



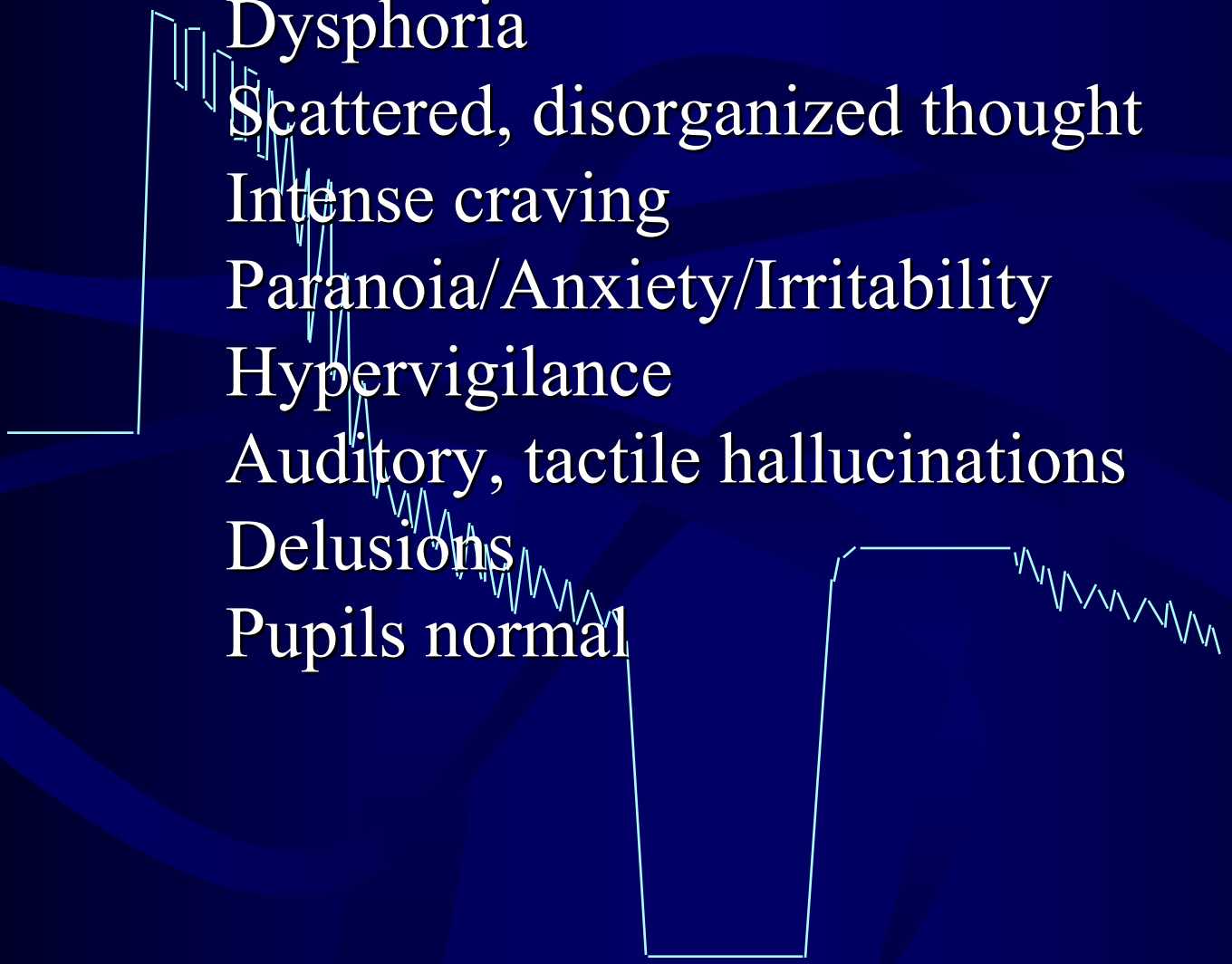
- Less intense euphoria
- Hyperactivity
- Rapid flight of ideas
- Obsessive/compulsive activity
- Thought blending
- Word salad
- Dilated pupils
- Shift from seeking of High to avoidance of Low



Methamphetamine Intoxication

"Tweaking":

- Dysphoria
- Scattered, disorganized thought
- Intense craving
- Paranoia/Anxiety/Irritability
- Hypervigilance
- Auditory, tactile hallucinations
- Delusions
- Pupils normal

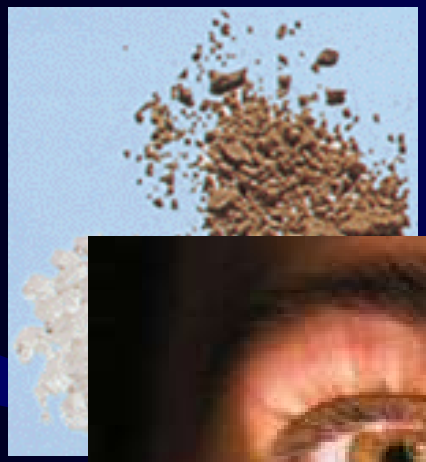


Methamphetamine Intoxication

Dealing with Tweakers

- Keep your distance
- Stay within central field of vision
- No bright lights
- Keep you hands in plain sight
- Engage them in reassuring dialogue
- Talk slowly with deep pitch
- Remind them that it’s the drug talking
- Care with restraints

Methamphetamine



Crank, Crystal, Speed, Meth

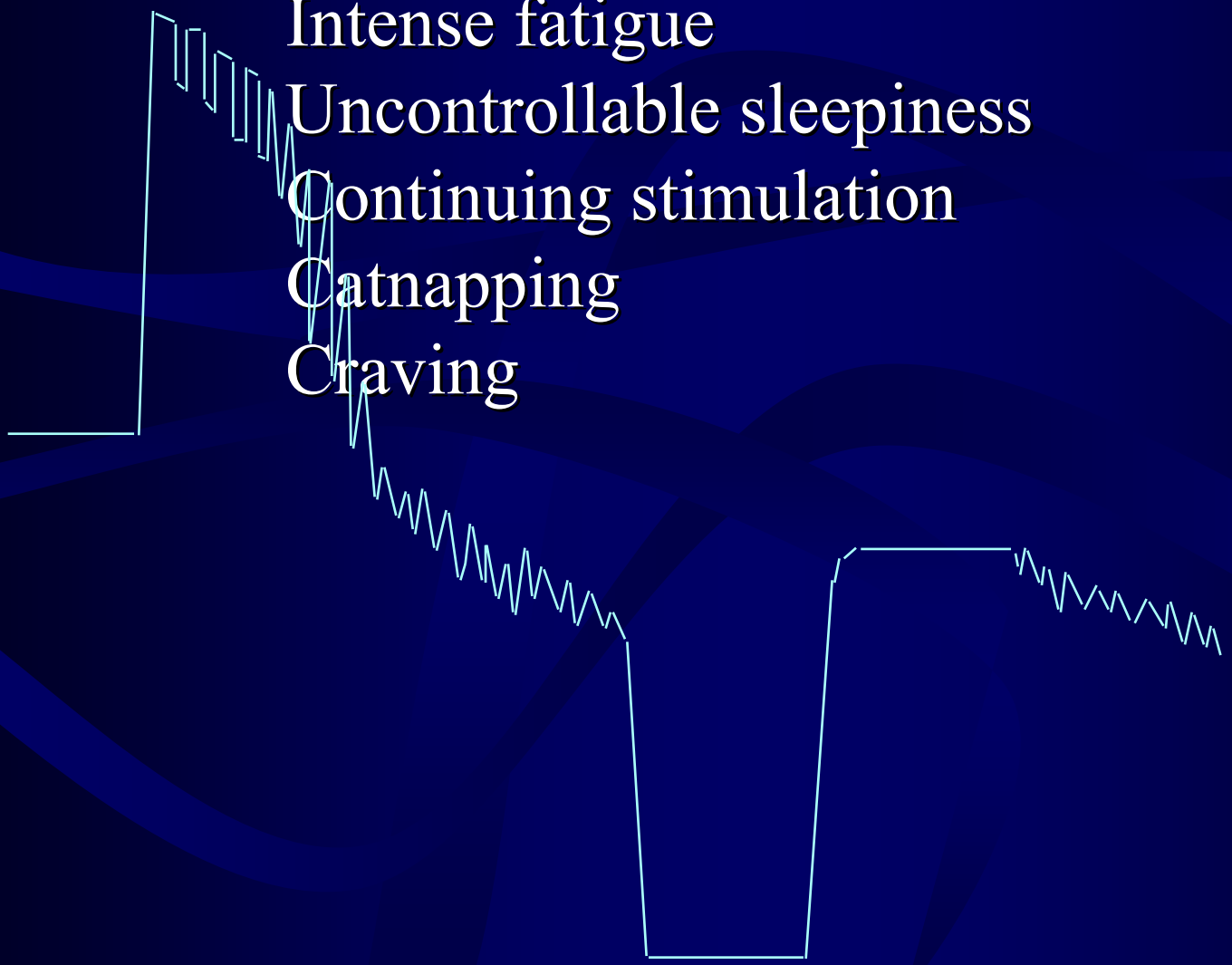
Meth withdrawal

- Fatigue
- Sleepiness
- Irritability
- Drug cravings
- Anxiety
- Depression
- Paranoia
- Delusions

Methamphetamine Intoxication

The Crash:

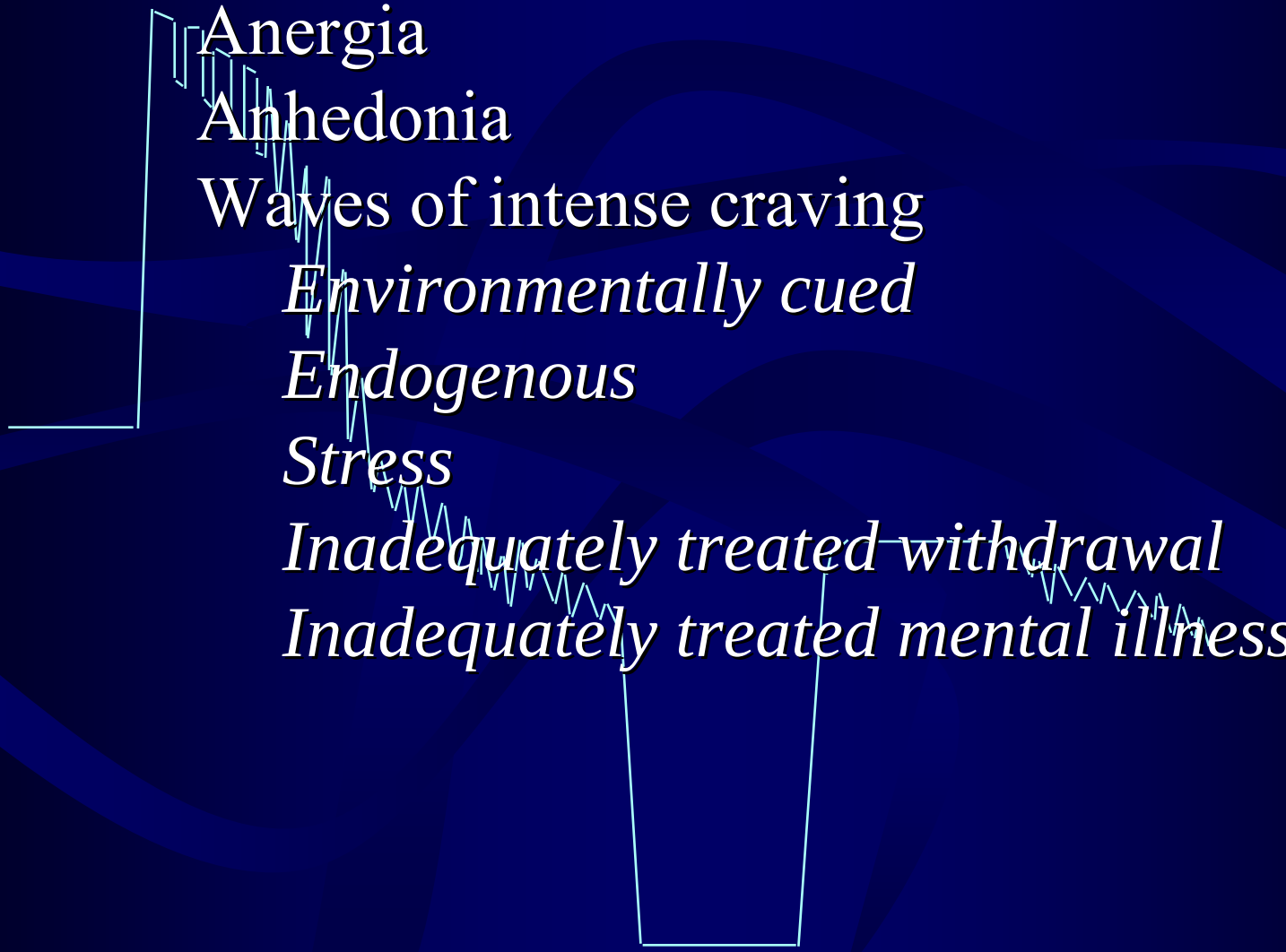
- Intense fatigue
- Uncontrollable sleepiness
- Continuing stimulation
- Catnapping
- Craving



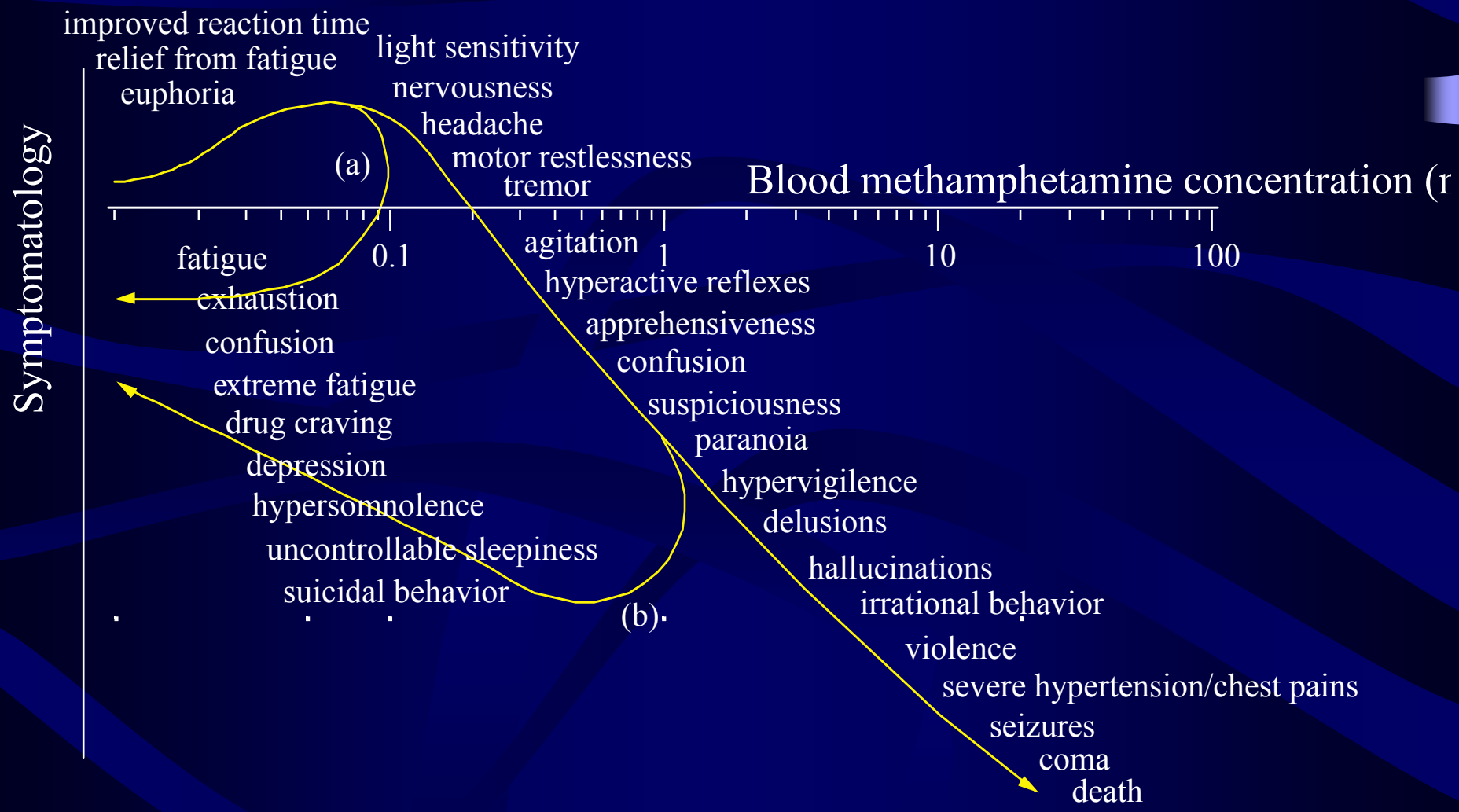
Methamphetamine Intoxication

Withdrawal:

- Anergia
- Anhedonia
- Waves of intense craving
  - *Environmentally cued*
  - *Endogenous*
  - *Stress*
  - *Inadequately treated withdrawal*
  - *Inadequately treated mental illness*



Methamphetamine Hysteresis



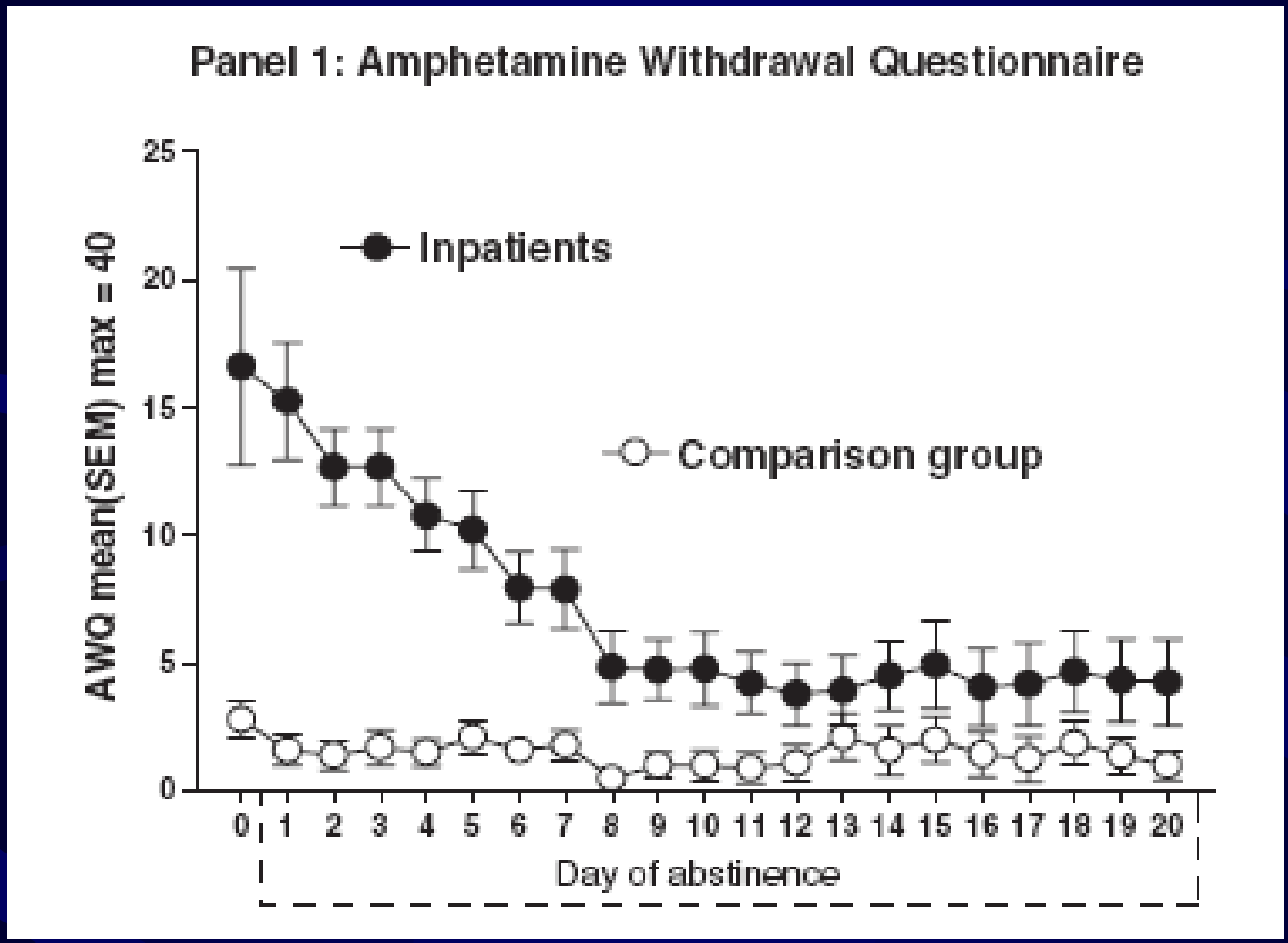
Methamphetamine withdrawal

The nature, time course and severity of methamphetamine withdrawal.

McGregor et al. Addiction. 2005 Sep;100(9):1320-9.

- Studied 21 patients undergoing withdrawal.
- Documented peak withdrawal within 24 hours
- Withdrawal characterized by:
  - Fatigue
  - Hypersomnia
  - Drug Craving
  - Food craving
  - Poor concentration
  - Tension
  - Depression

Methamphetamine withdrawal



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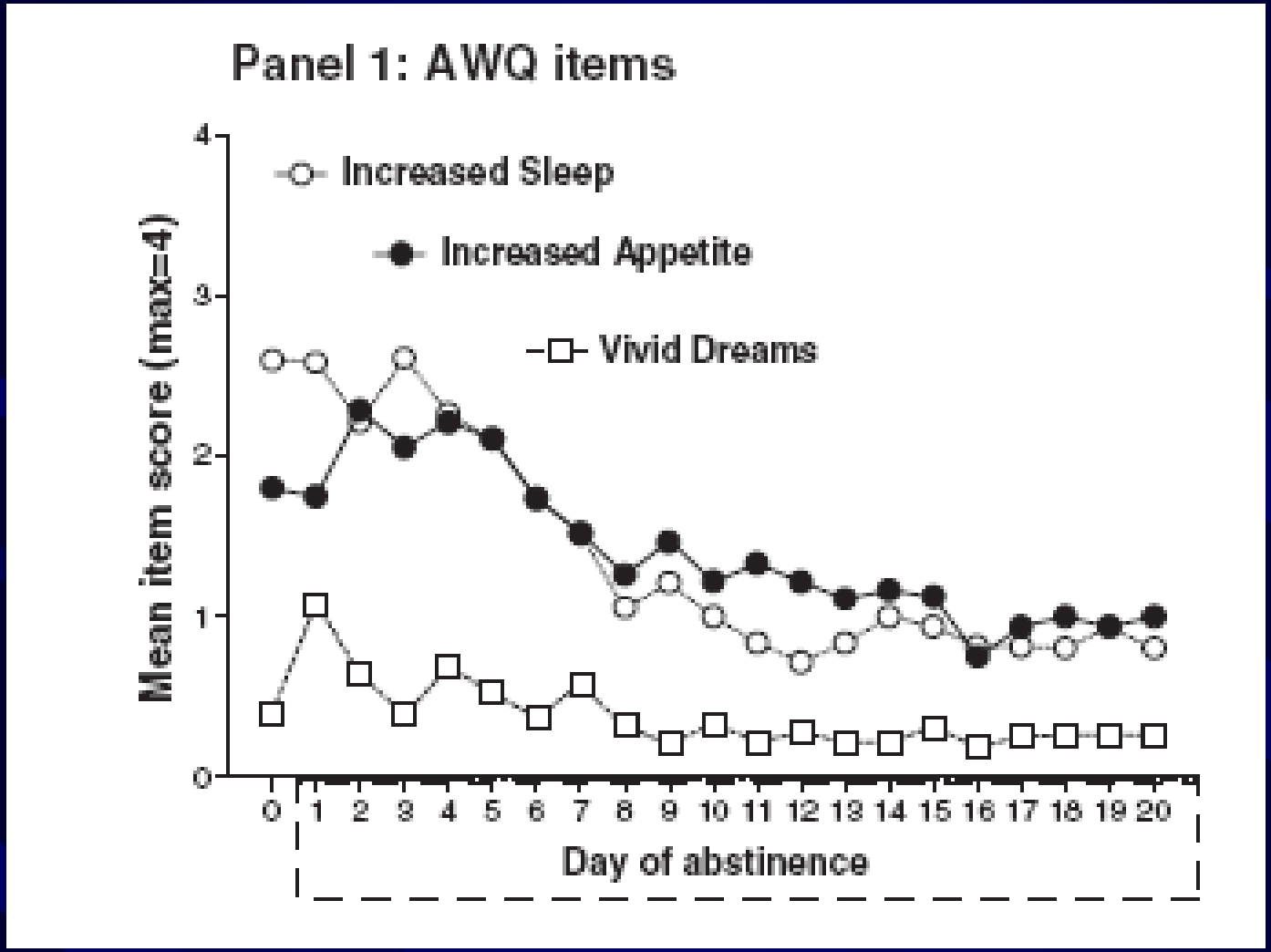

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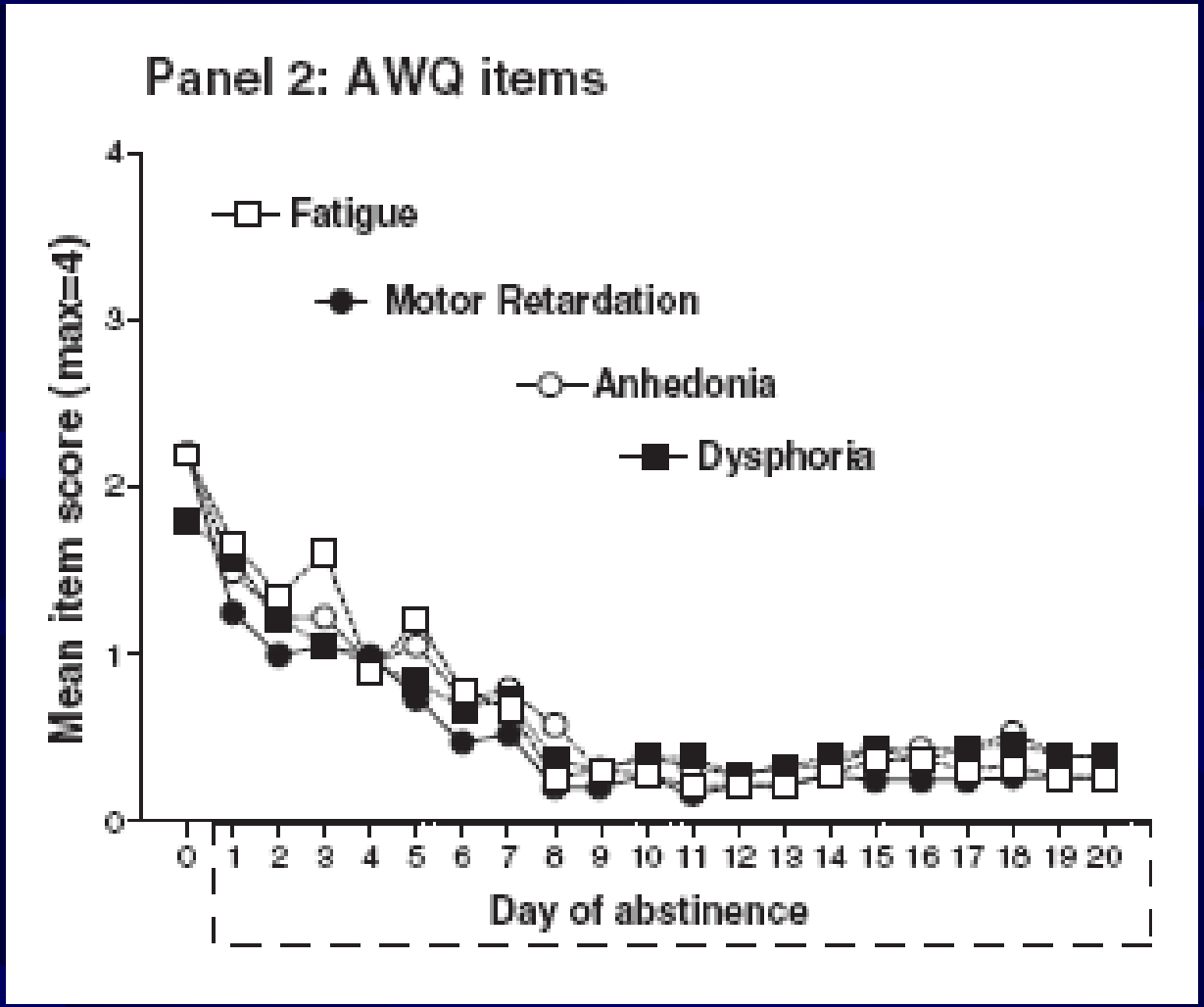

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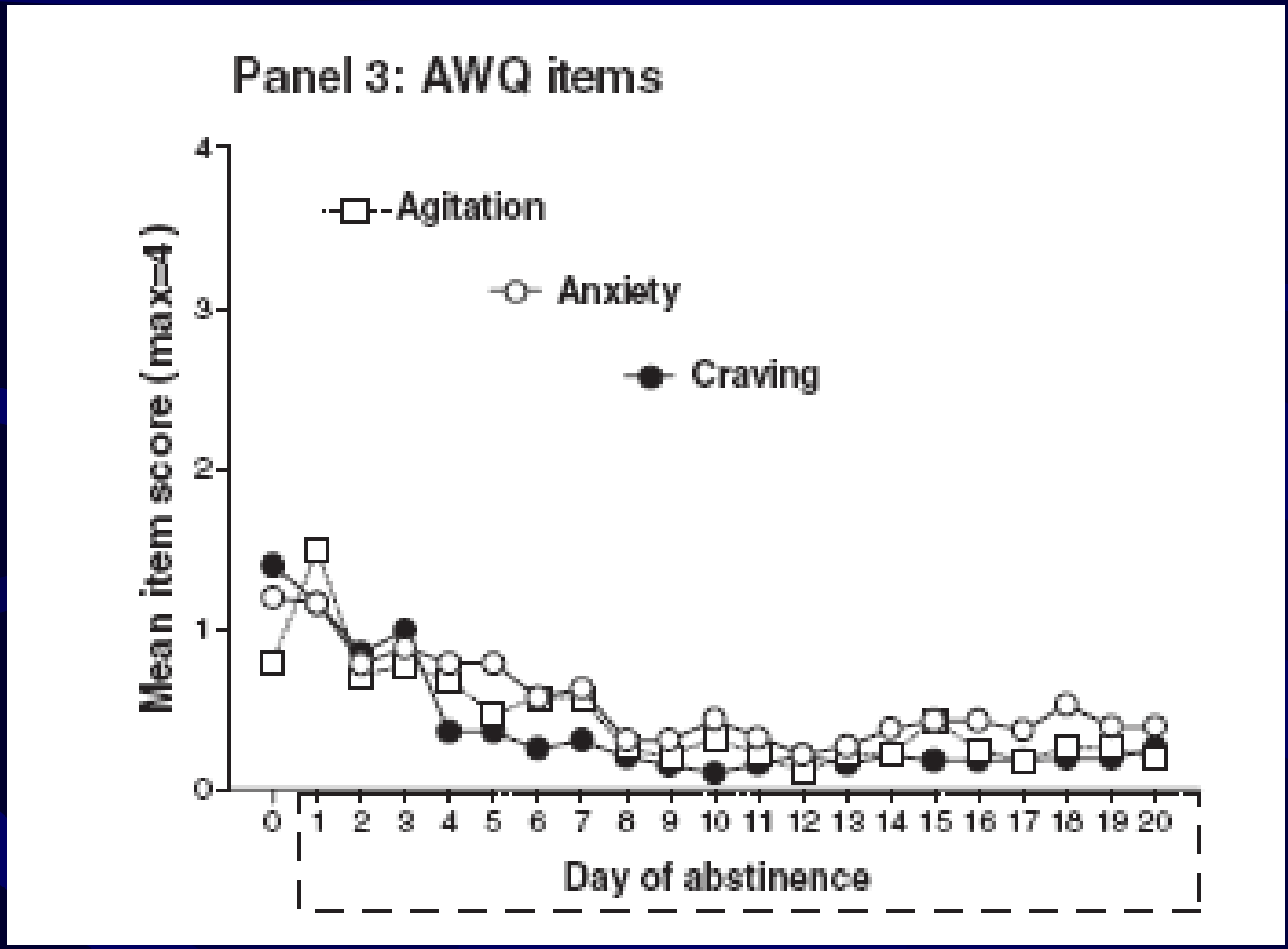

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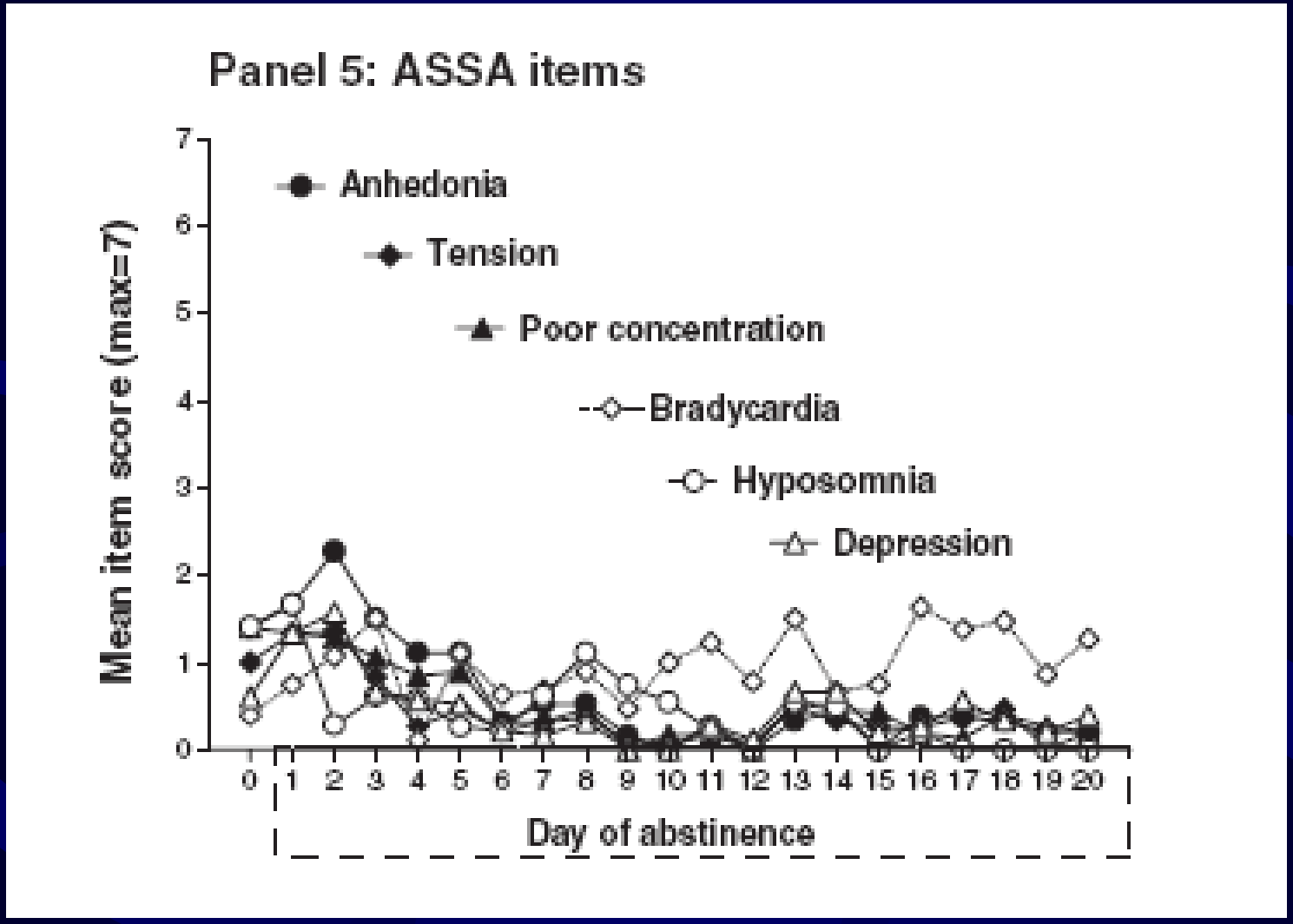

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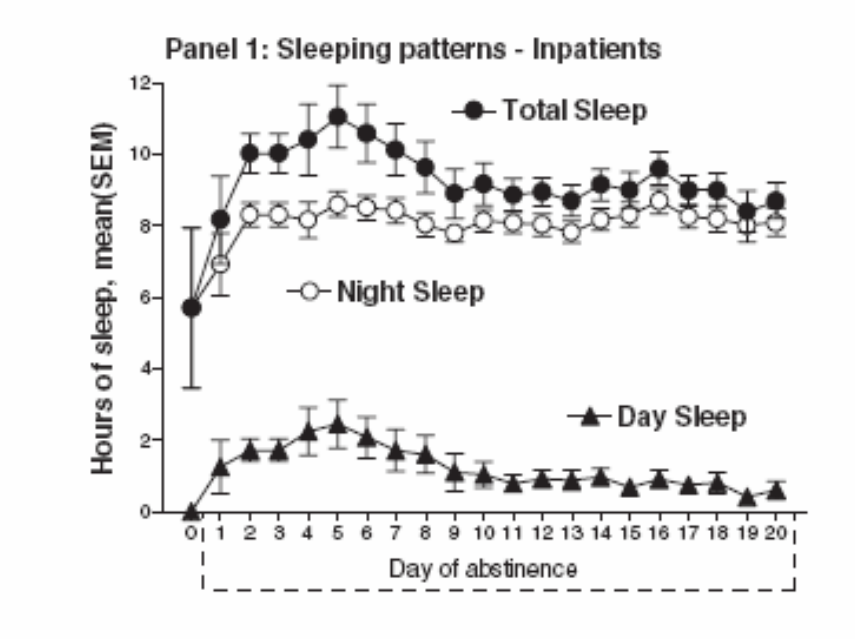

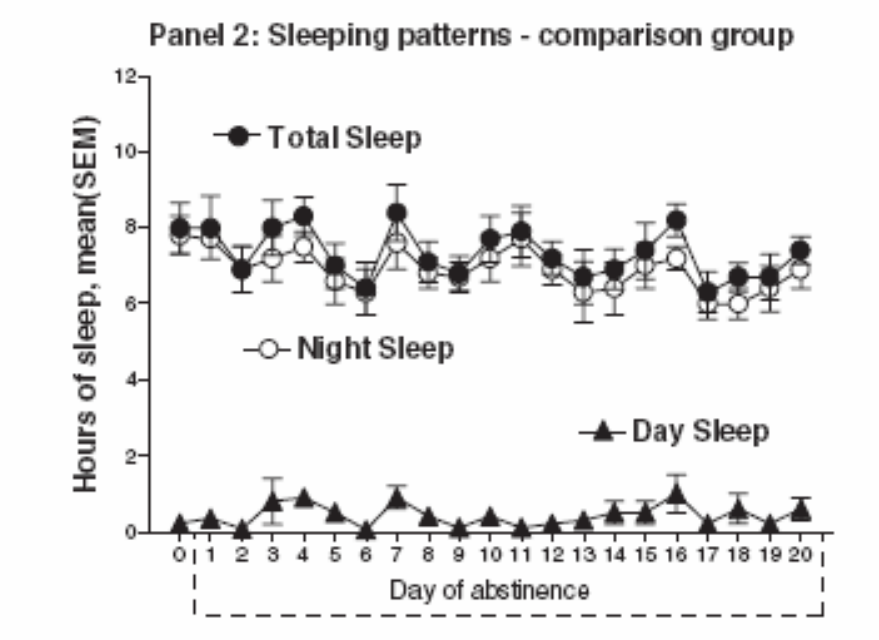

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Methamphetamine withdrawal

The nature, time course and severity of methamphetamine withdrawal.

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- Sleep patterns were disrupted.
  - More daytime sleeping.
  - Less clearheaded on awakening.
  - Poorer quality of sleep.
  - More frequent awakenings at night.
- Acute withdrawal period lasted 9 days.

Methamphetamine: the DRE Assessment

	Acute	Downside
HGN	No	No
VGN	No*	No
Lack of convergence	No	No
Pupil size	Dilated	Normal/constricted
Rxn to light	Slow	Slow
Pulse	Up	Normal to slow
BP	Up	Normal
Temp.	Up	Normal

Methamphetamine: the DRE Assessment

	Acute	Downside	Narcotic
HGN	No	No	No
VGN	No*	No	No
Lack of convergence	No	No	No
Pupil size	Dilated	Normal/constricted	Constricted
Rxn to light	Slow	Slow	Little/none
Pulse	Up	Normal to slow	Down
BP	Up	Normal	Down
Temp.	Up	Normal	Down

Methamphetamine: the DRE Assessment

Other Indicators:

- Speech may be slurred/slow/
- May be “on the Nod”.
- May cycle from alert/agitated to asleep.
- May be lethargic
- May be suicidal/depressed

Methamphetamine and Driving

Review of 101 DRE cases

101 Cases Methamphetamine ONLY

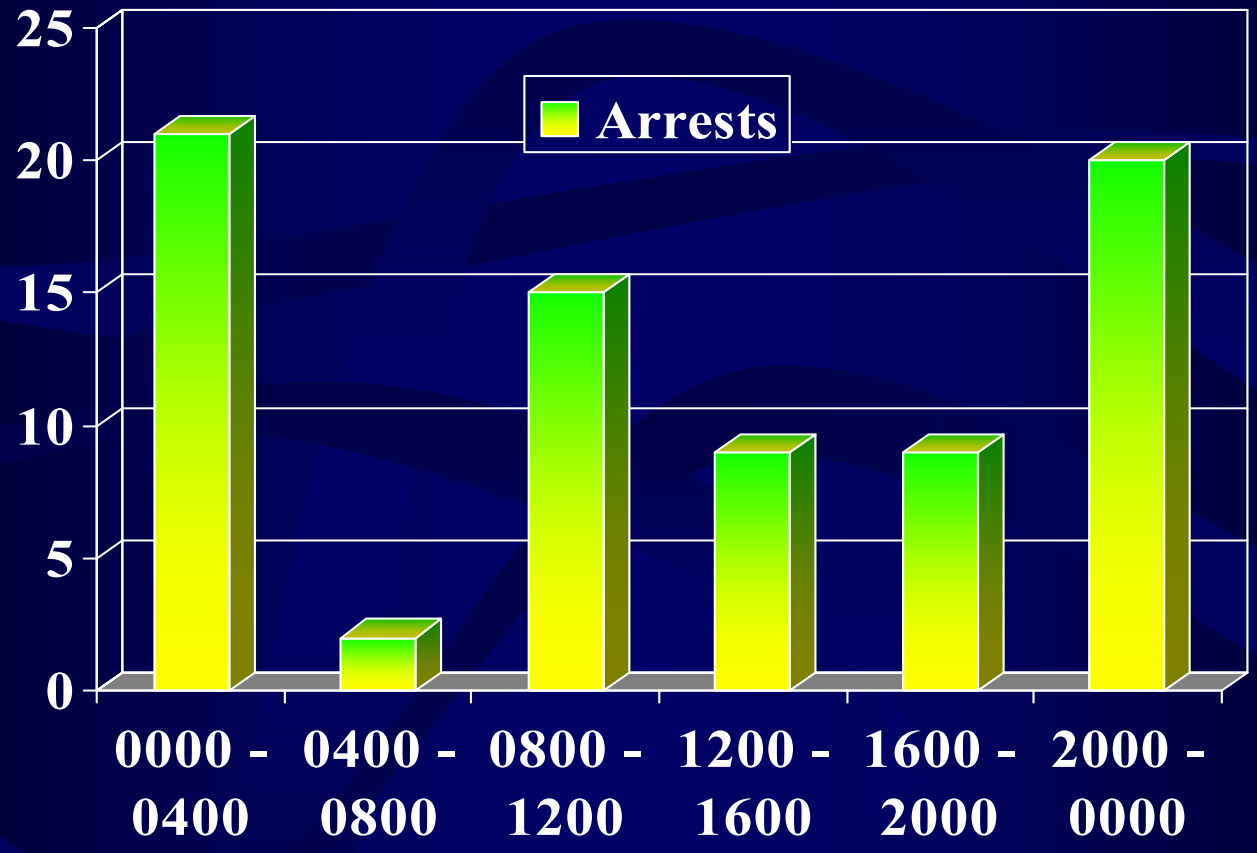
Alcohol <0.02g/100mL, Blood cannabinoids <10ng/mL

	Count	Mean age	Mean (mg/L)	Median (mg/L)	Range (mg/L)
♂	74	30.6	0.36	0.27	<0.05 – 2.34
♀	27	31.9	0.34	0.19	<0.05 – 2.36

Logan, 2001

Methamphetamine and Driving

Time distribution of arrests

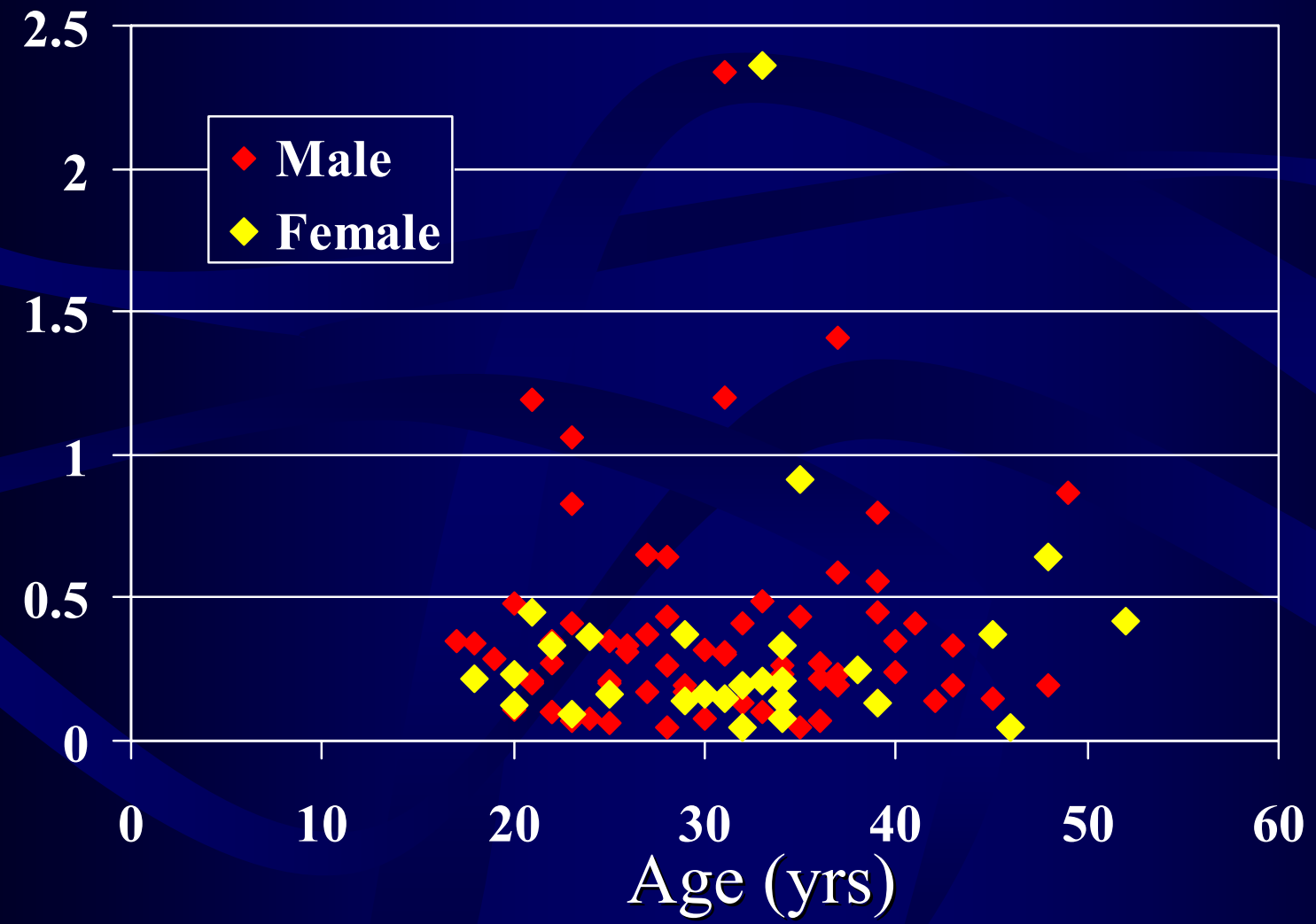


Methamphetamine and Driving

Reason for stop	#	%
Lane Travel (OOL)	23	33
Erratic Driving	9	13
Equipment	9	13
Accident	8	12
Speeding	7	10
CVE	3	4
Hit and Run	2	3
Lane Travel (WL)	2	3
Stolen Vehicle	2	3
Eluding	1	1
Fail to Signal	1	1
Reckless Driving	1	1
Wrong way	1	1

Methamphetamine and Driving

Age/Gender/Concentration Distribution



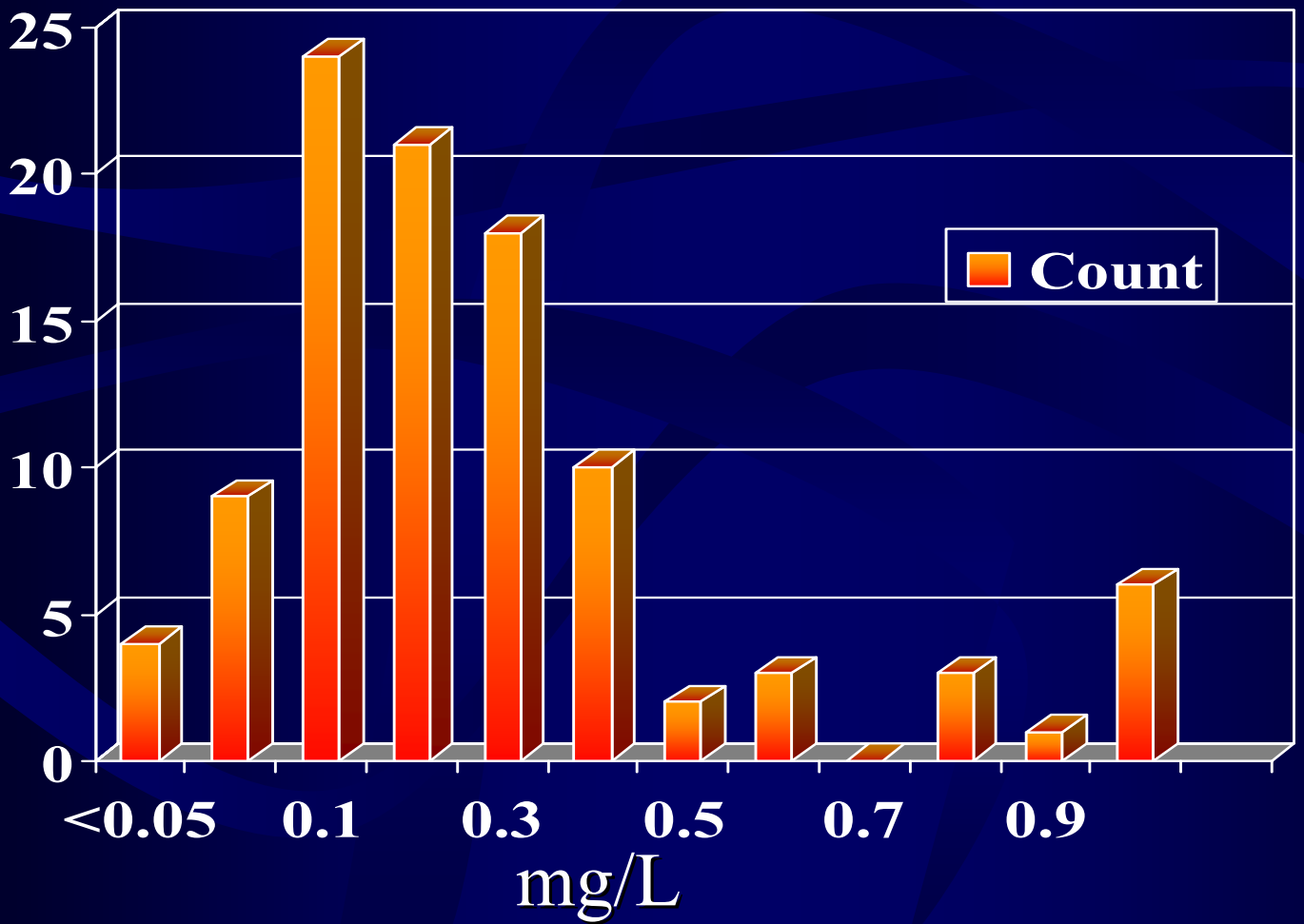
♂ = 74

♀ = 27

Methamphetamine and Driving

Methamphetamine distribution (mg/L)

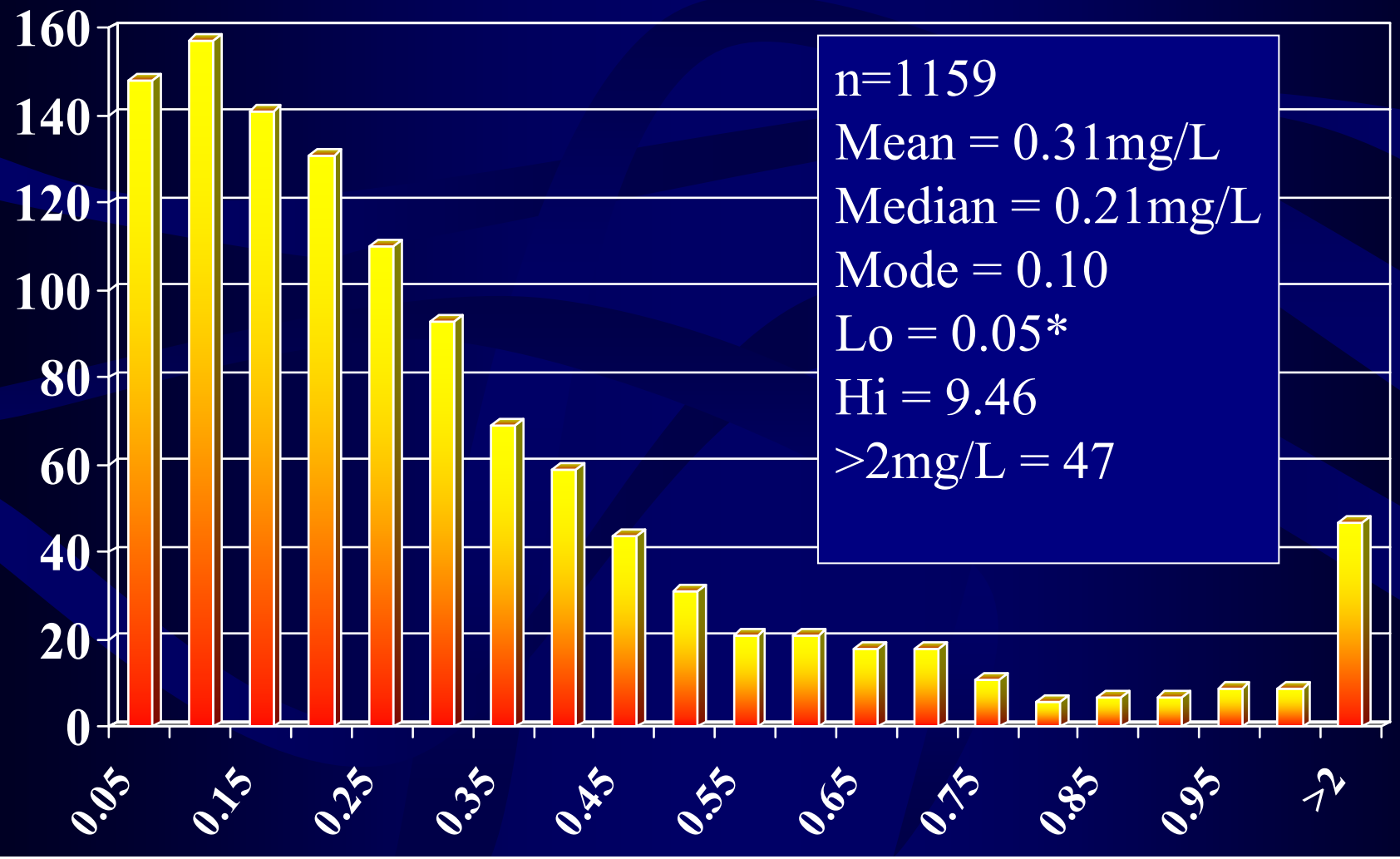
Mean = 0.35mg/L, Median = 0.23mg/L



Methamphetamine Drivers

Methamphetamine Concentrations in Impaired Drivers

Logan (unpublished, 2006)



Stimulants and Driving

SFST Impairment indicators:

One Leg Stand

Sways, Uses arms, Hops, Foot touches, Inches of sway (in. bf/ss)

Walk and Turn

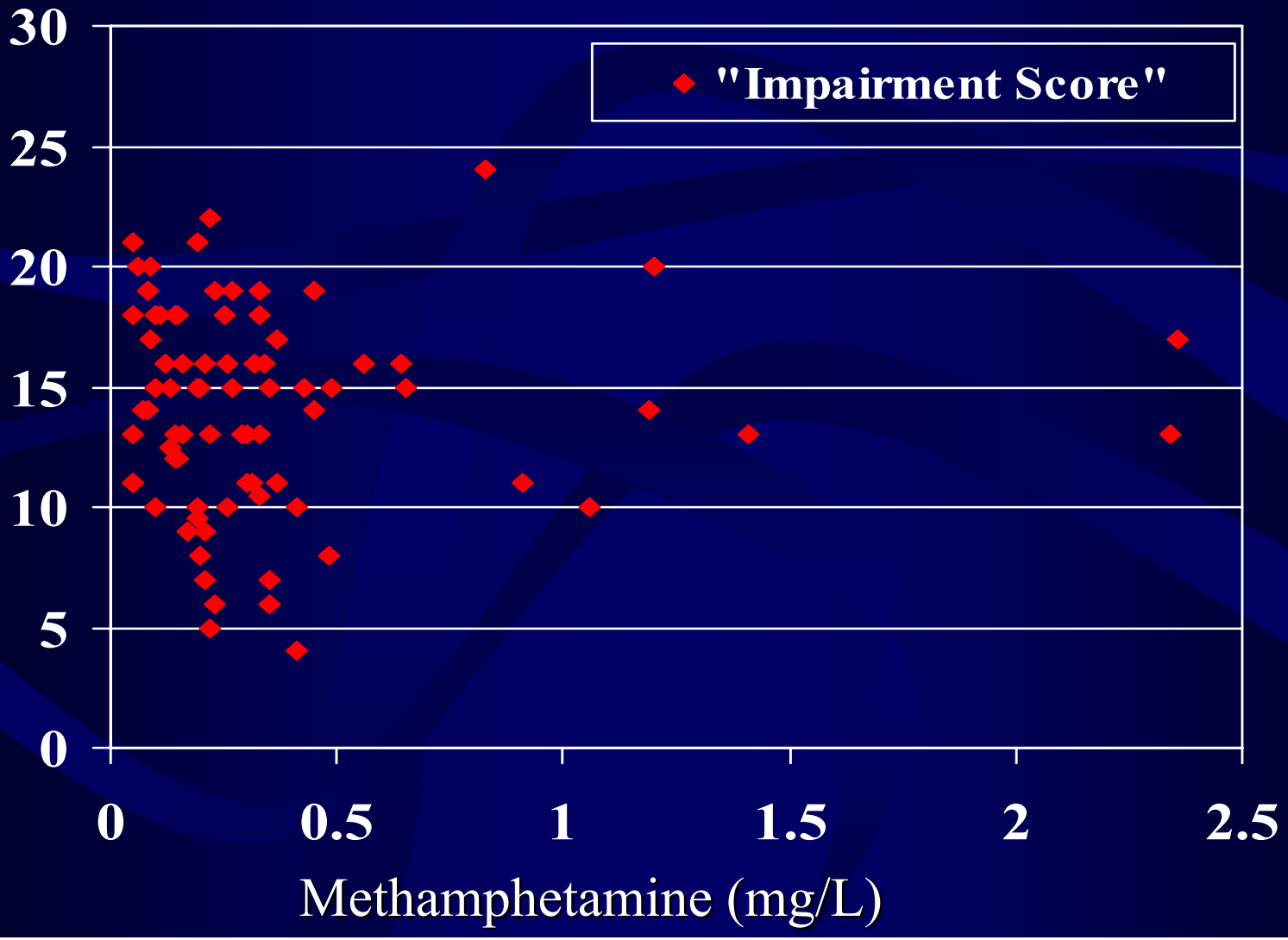
Can't balance, Starts too soon, misses heel to toe, walks off line, stops, puts arms up, incorrect # steps

Finger to nose

Accuracy on 6 attempts

Methamphetamine and Driving

Impairment vs. methamphetamine conc.



Methamphetamine and Driving

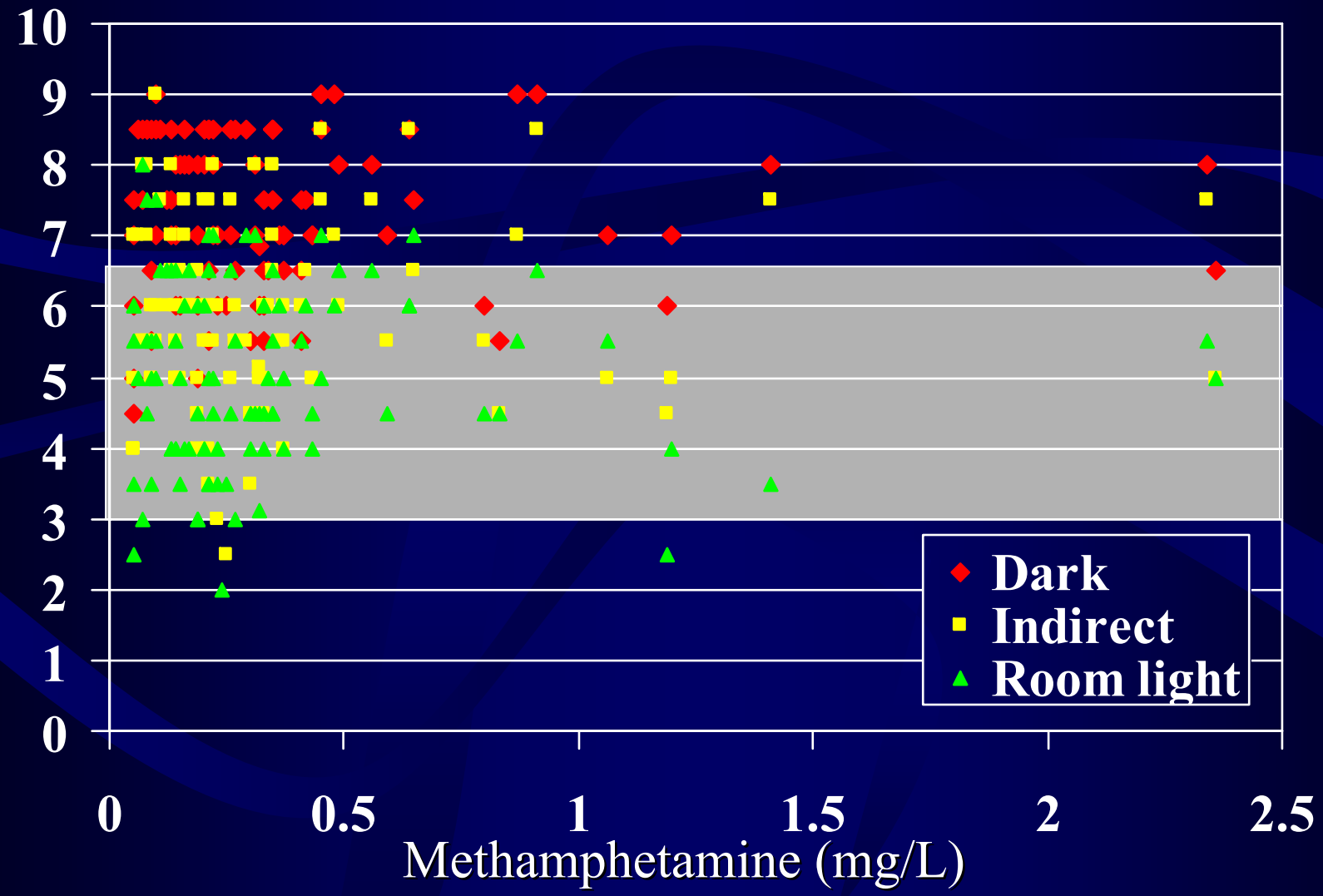
Methamphetamine Behaviors:

Eyes:

- Tracking and pupils equal in all.
- All could follow stimulus.
- Bloodshot, watery (80%), red, glassy.
- Eyelids droopy in about half
- HGN: Only 6 had more than 3 clues and they all had 6.
- VGN: 2 (also had 6 clues in HGN).
- 25 had lack of convergence.

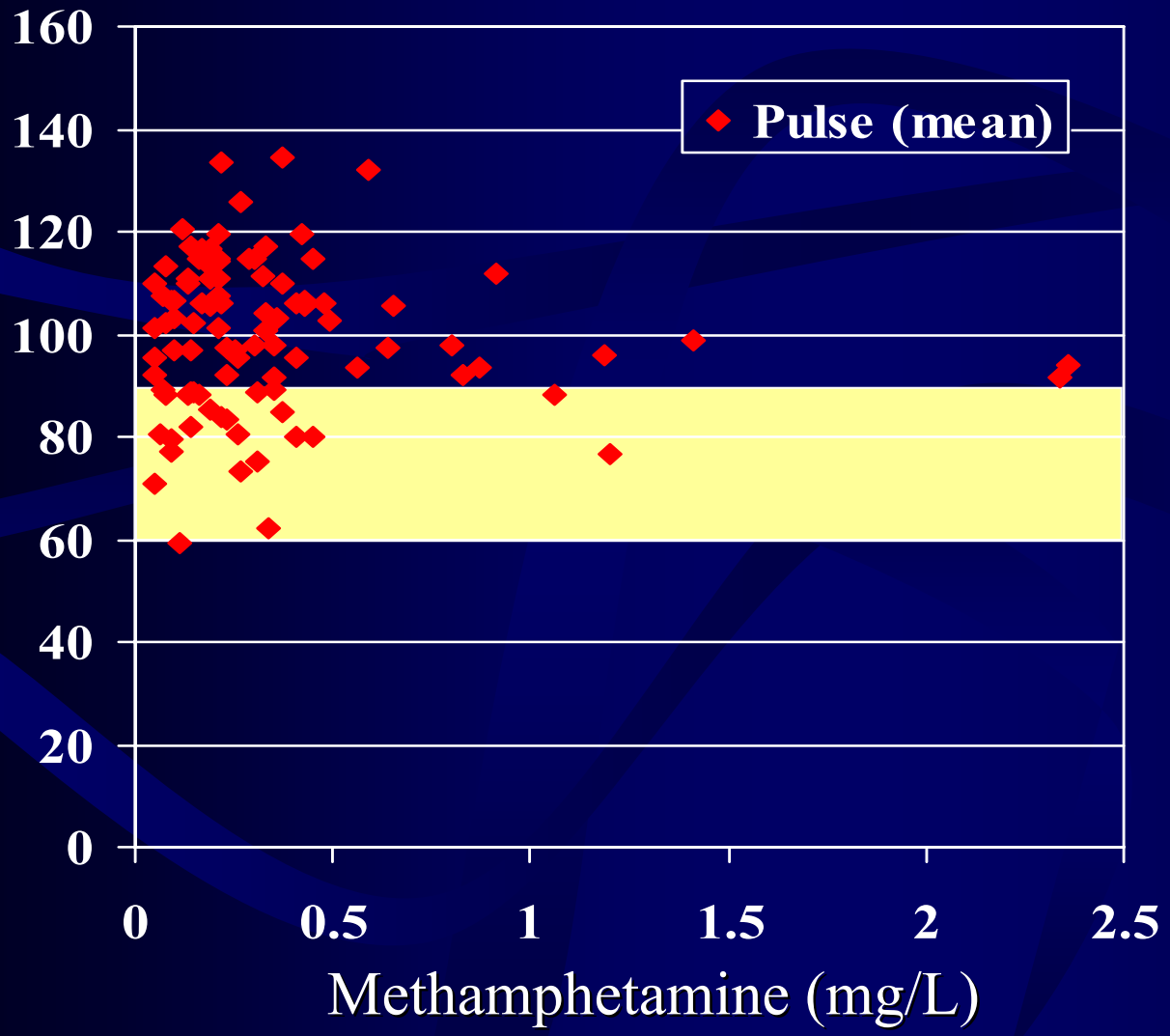
Methamphetamine and Driving

Pupil diameter and methamphetamine conc.



Methamphetamine and Driving

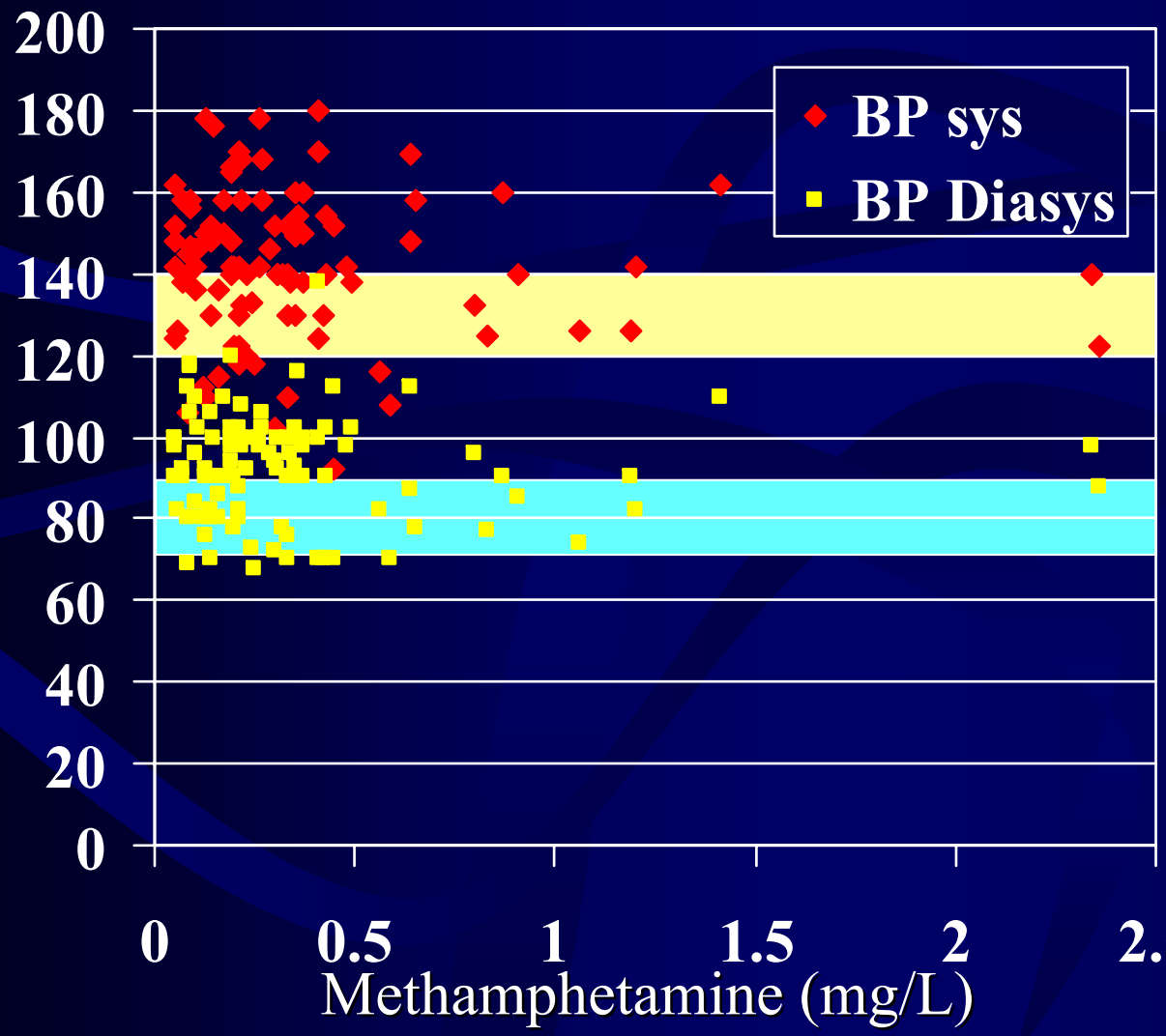
Pulse vs. methamphetamine conc.



74% exceed normal range (60-90 BPM)

Methamphetamine and Driving

Blood pressure and methamphetamine conc.

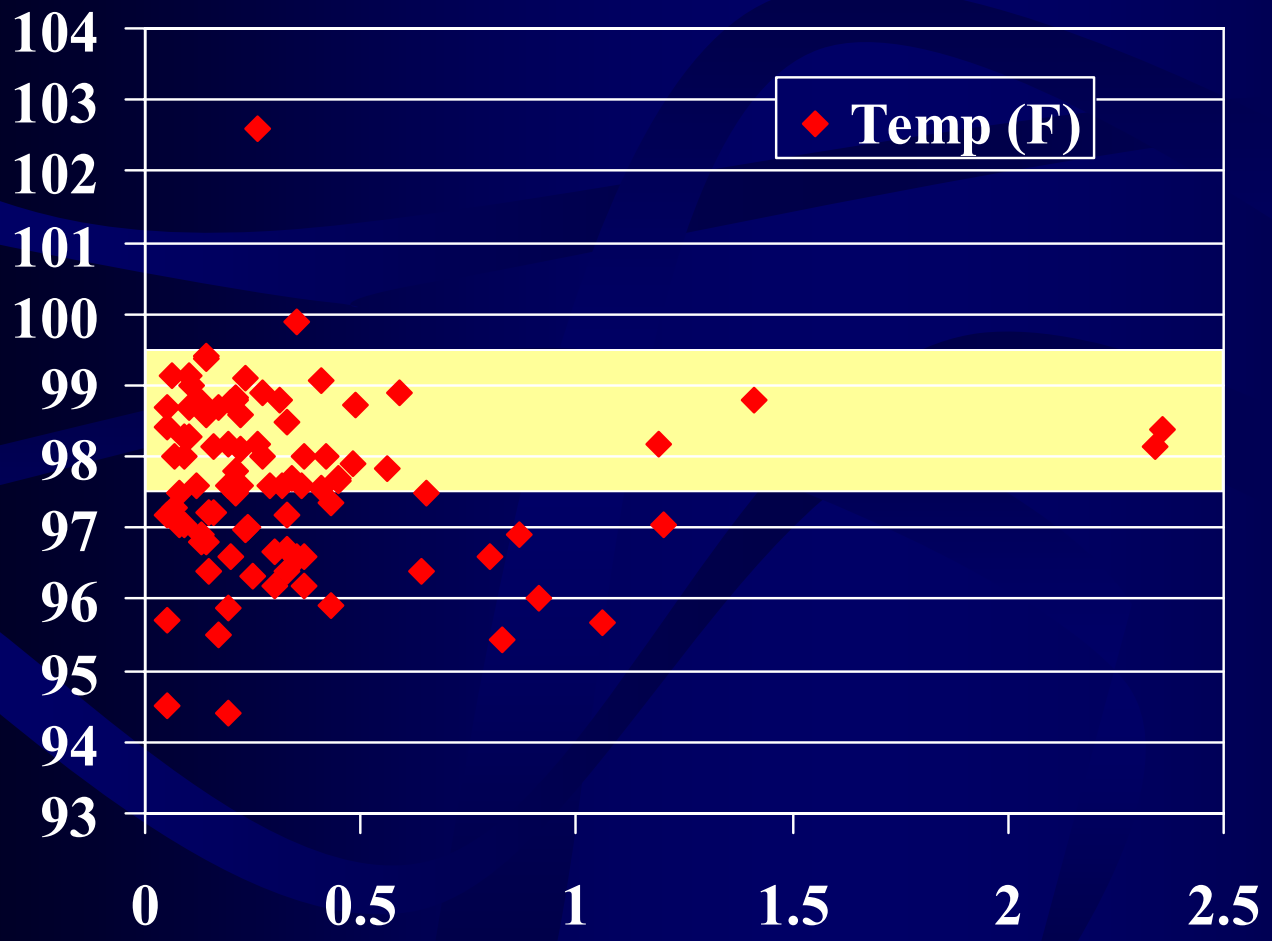


Systolic – 66% exceed normal

Diasystolic – 50% exceed normal

Methamphetamine and Driving

Body temperature and methamphetamine



53% fell below normal temperature range of 97.6 – 99.6°F

3% exceeded

Methamphetamine and Driving

Methamphetamine Behaviors:

Coordination:
Poor, jerky, fast movements, jittery, fidgeting, staggering , awkward, unsteady, clumsy, deliberate, slow.

Speech:
Fast, rapid, non-stop, unintelligible, mumbling, low, raspy, hoarse, slow, thick tongued.

Injection marks
29% track marks, 26% recent injections
Same for ♂ and ♀.

Methamphetamine and Driving

DRE Call	All (n= 101)	Adm. (n=76)	No Adm.(n=14)
Stimulant	64	53	7
Stimulant & Cannabis	11	9	1
Stimulant & Narcotic	7	4	1
Stimulant & Depressant	5	3	2
Stimulant, Depressant & Cannabis	3	2	0
Stimulant, PCP, Cannabis	1	1	0
Any Stimulant Call	***90%***	***95%***	***79%***
No Drugs Present	2	1	1
Cannabis	3	2	1
Depressant	1	0	1
Cannabis & Narcotic	1	1	0
Depressant, Narcotic & Cannabis	1	0	0
Depressant & Narcotic	1	0	0

Methamphetamine and Driving

Conclusions

- Methamphetamine impairs during both the acute intoxication phase and the withdrawal or downside phase.
- The upside impairment is more agitated, euphoric, impulsive, risk taking, hypervigilant, paranoid.
- The downside impairment is more like CNS depression, with fatigue, sleepiness, motor retardation, poor concentration.
- The physiological signs may not exactly fit the matrix.