

Beyond the Brain:

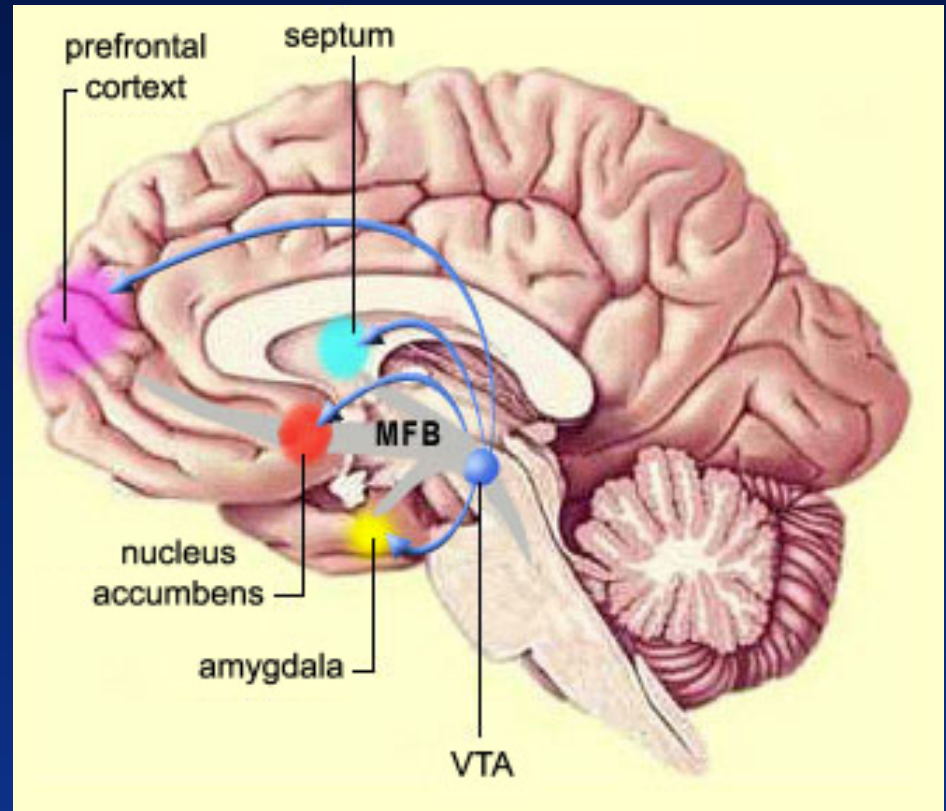
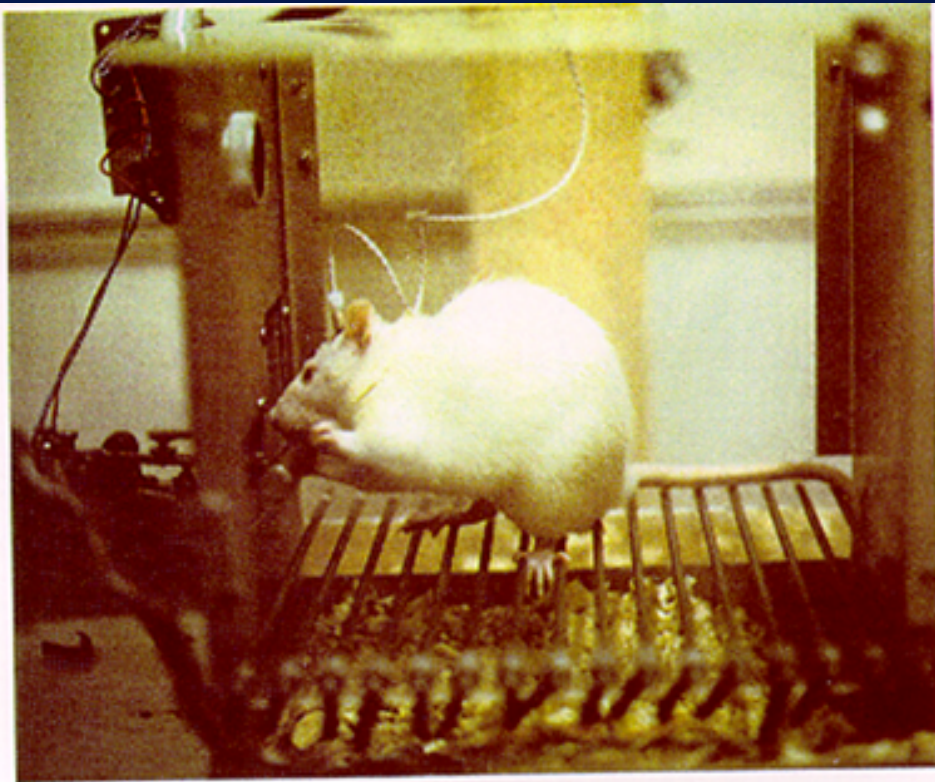
Interactions between drugs and society

Carl L. Hart, Ph.D.

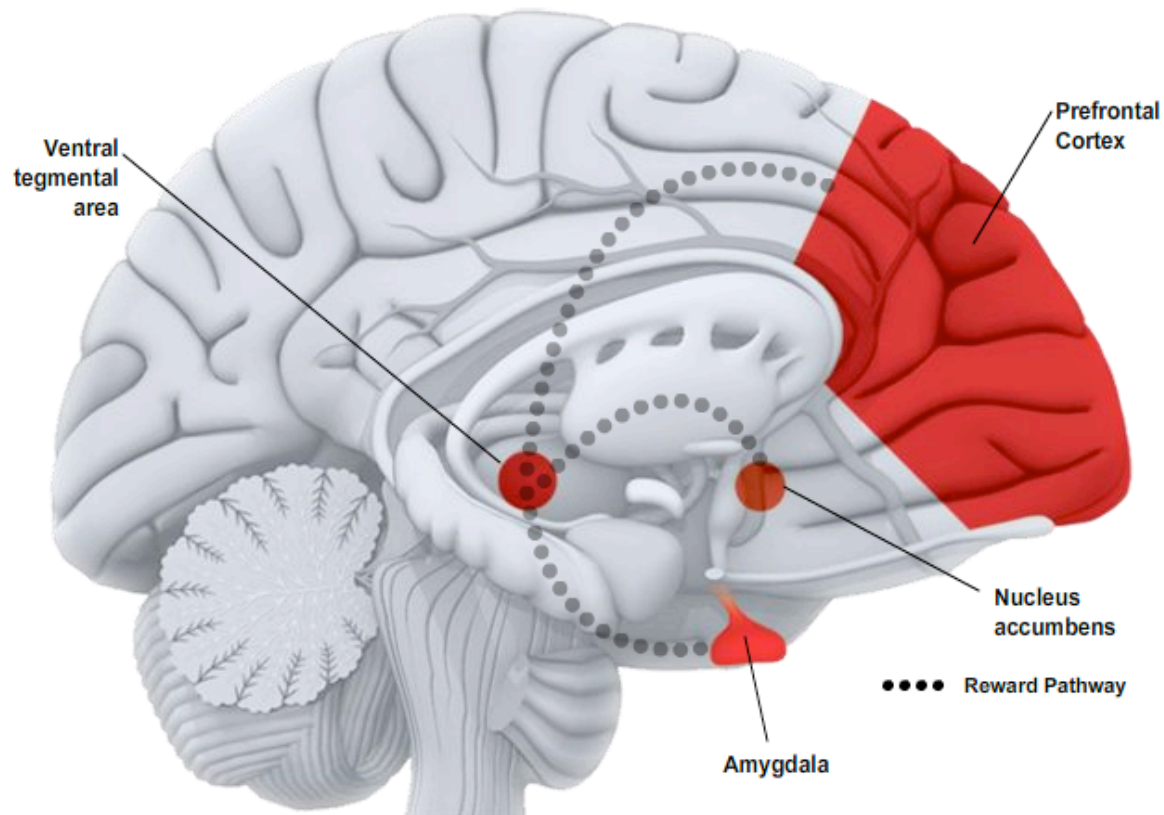
**Department of Psychology, Columbia University,
Division on Substance Abuse, New York State Psychiatric Institute,
Department of Psychiatry, College of Physicians & Surgeons of Columbia University,
and
Institute for Research in African-American Studies, Columbia University**

Positive reinforcement produced by electrical stimulation of the septal area and other regions of rat brain

James Olds and Peter Milner (1954)



All of the drugs of abuse increase DA activity in the nucleus accumbens



Smoked Cocaine Self-Administration is Decreased by Modafinil

Carl L Hart^{*1,2}, Margaret Haney¹, Suzanne K Vosburg¹, Eric Rubin¹ and Richard W Foltin¹

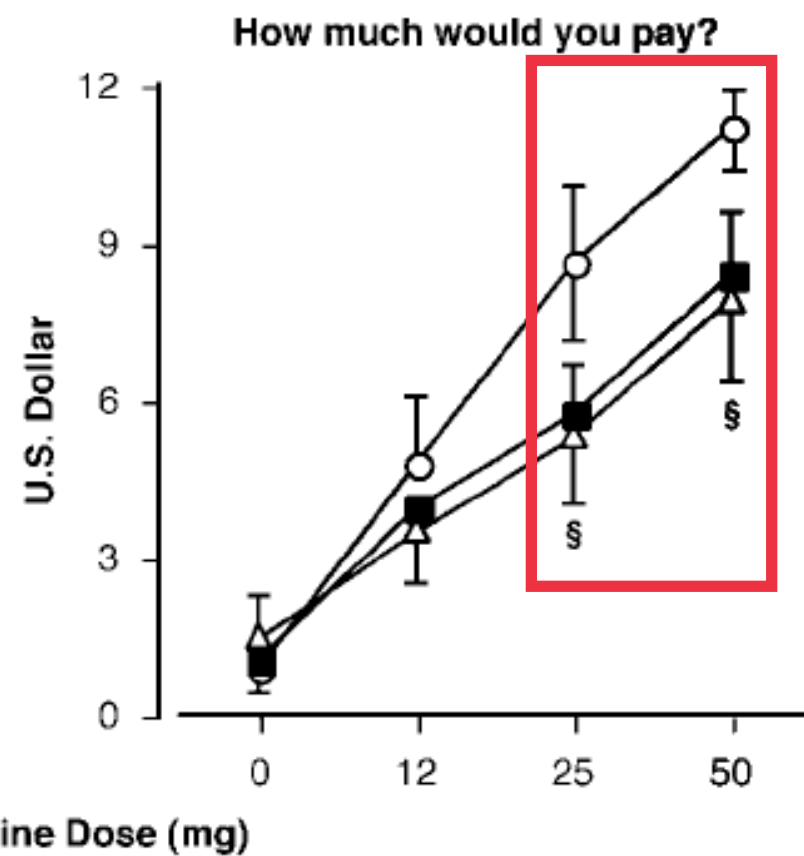
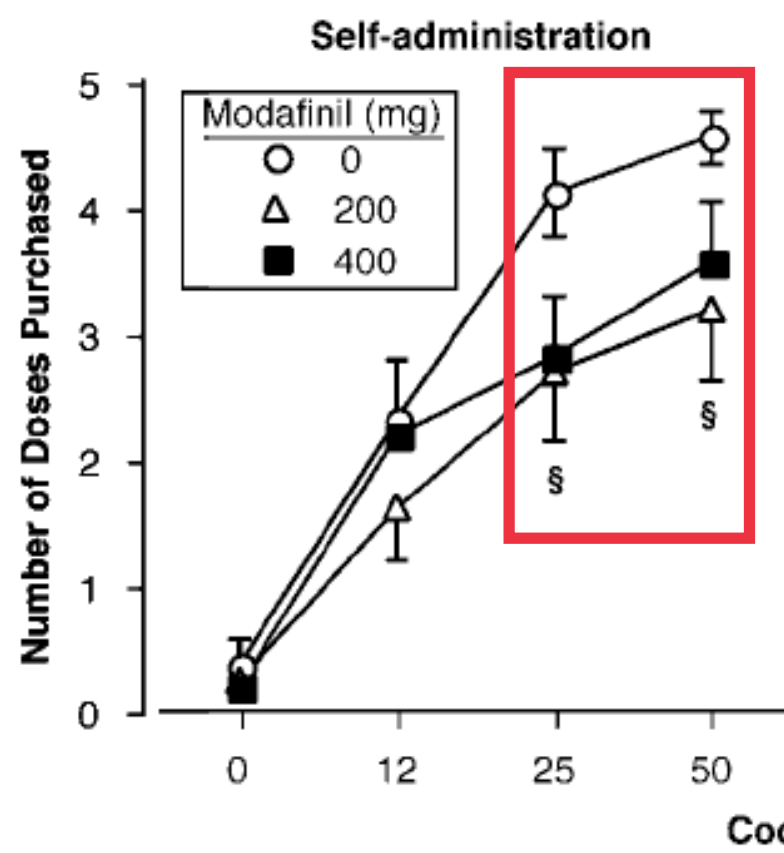
¹Division on Substance Abuse, New York State Psychiatric Institute and Department of Psychiatry, College of Physicians and Surgeons of Columbia University, New York, NY, USA; ²Department of Psychology, Columbia University, New York, NY, USA

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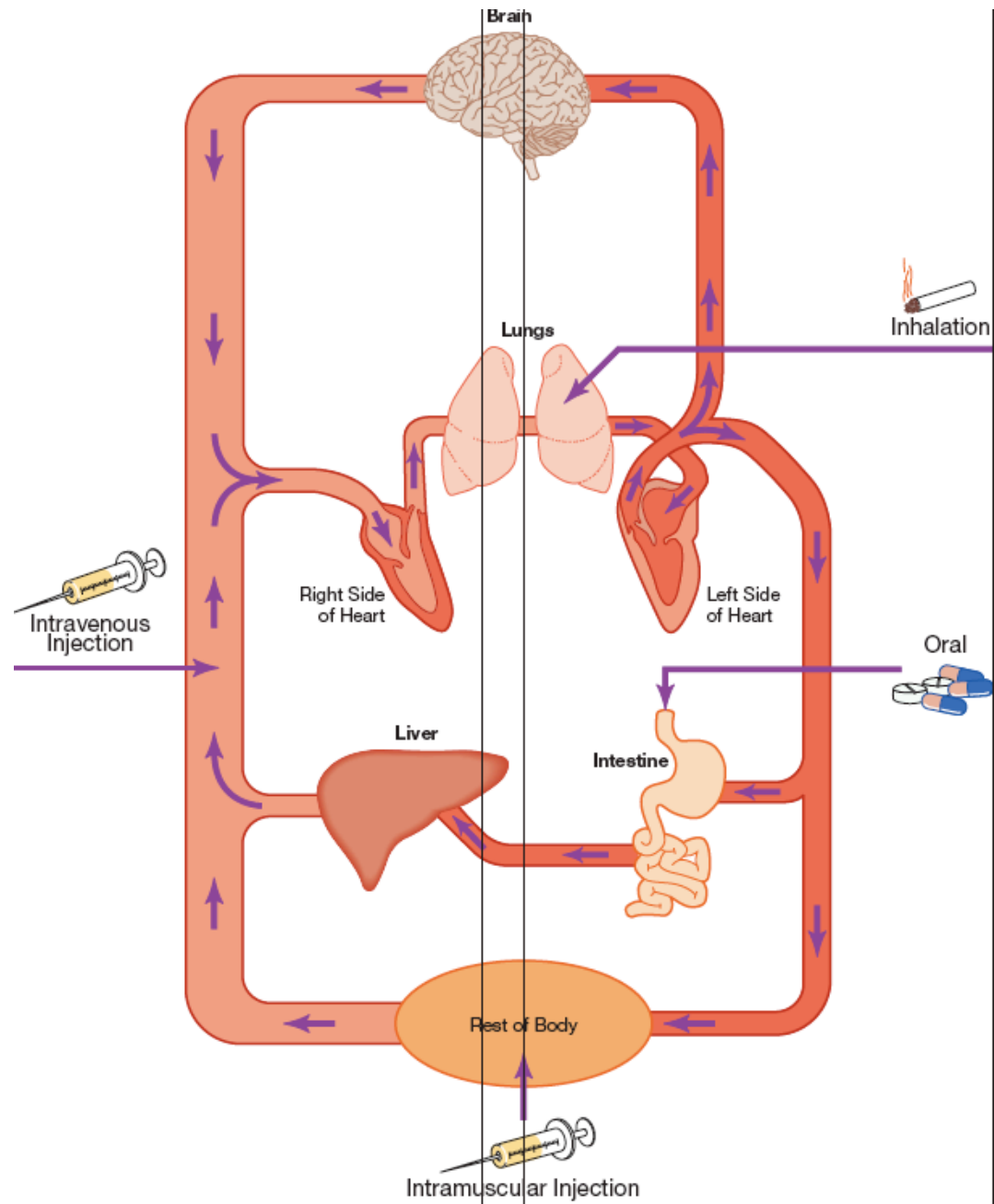
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- **Modafinil (Provigil®)**
 - Approved to treat excessive daytime sleepiness
- **Mechanism of action remains unclear, but**
 - Hypothesized: increase catecholaminergic activity
 - Also increase glutamatergic and histaminergic transmission and decrease GABAergic transmission

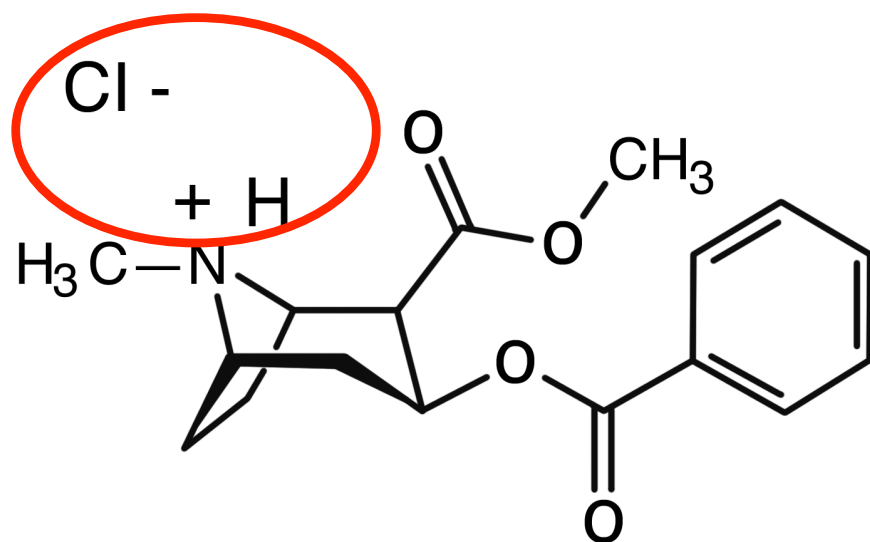


Basics

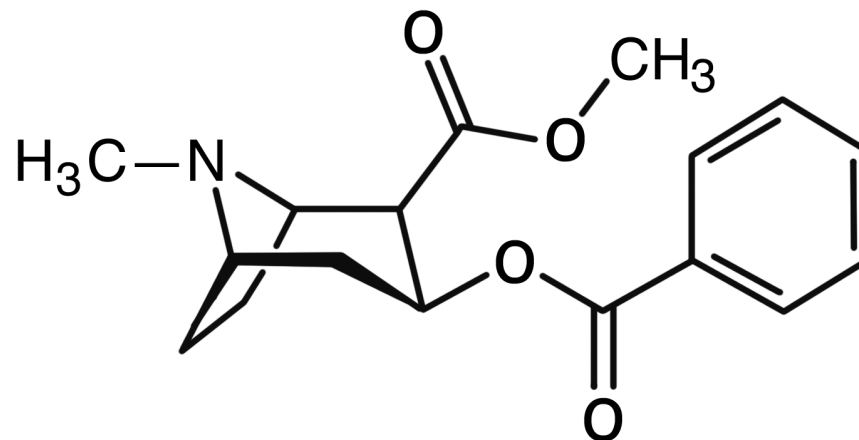
- Dose
- Route of administration



Powder Cocaine



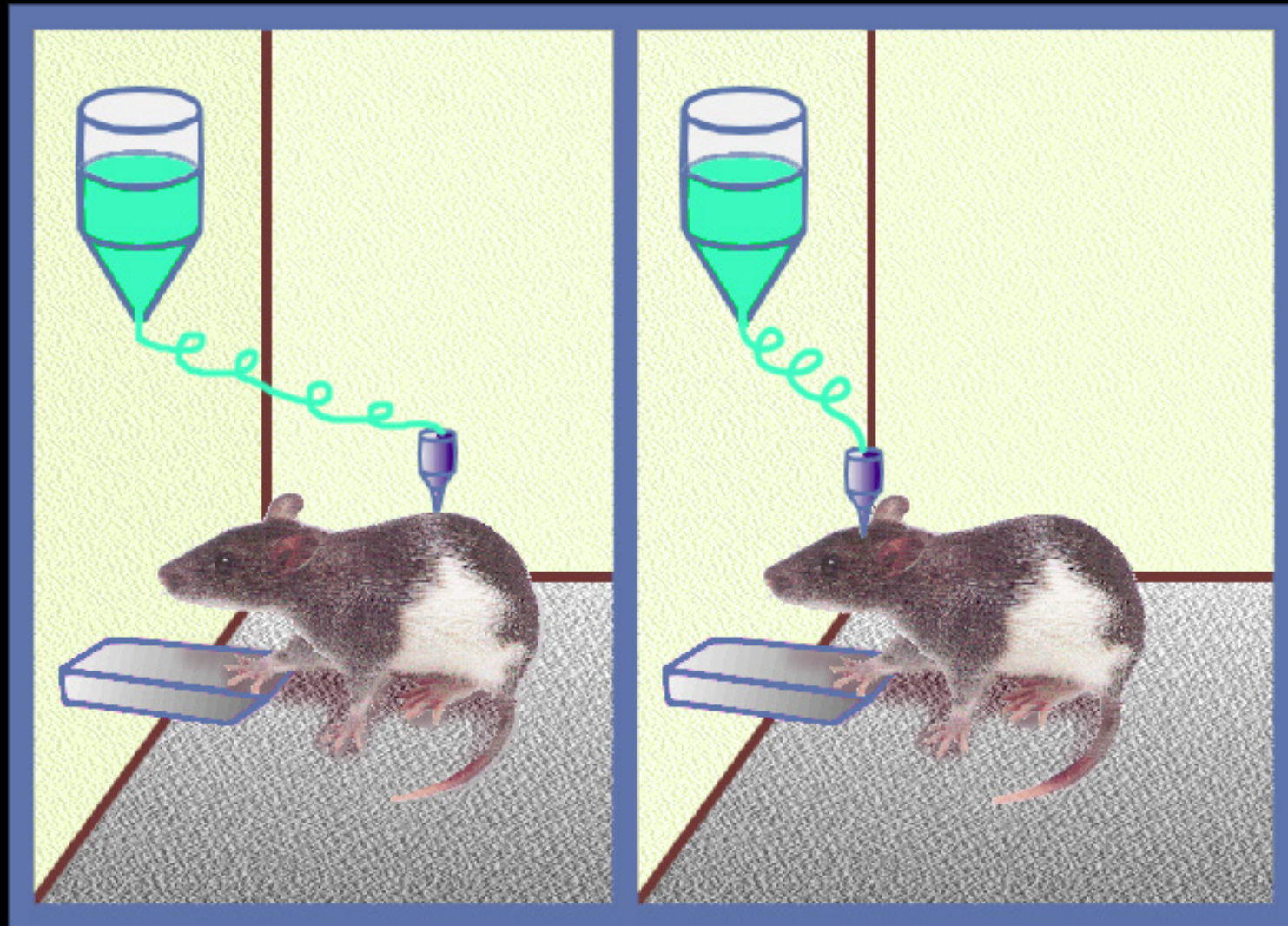
Crack Cocaine



Basics

- Dose
- Route of administration
- User's experience (set)
- **Environment (setting)**

Drug Self-administration





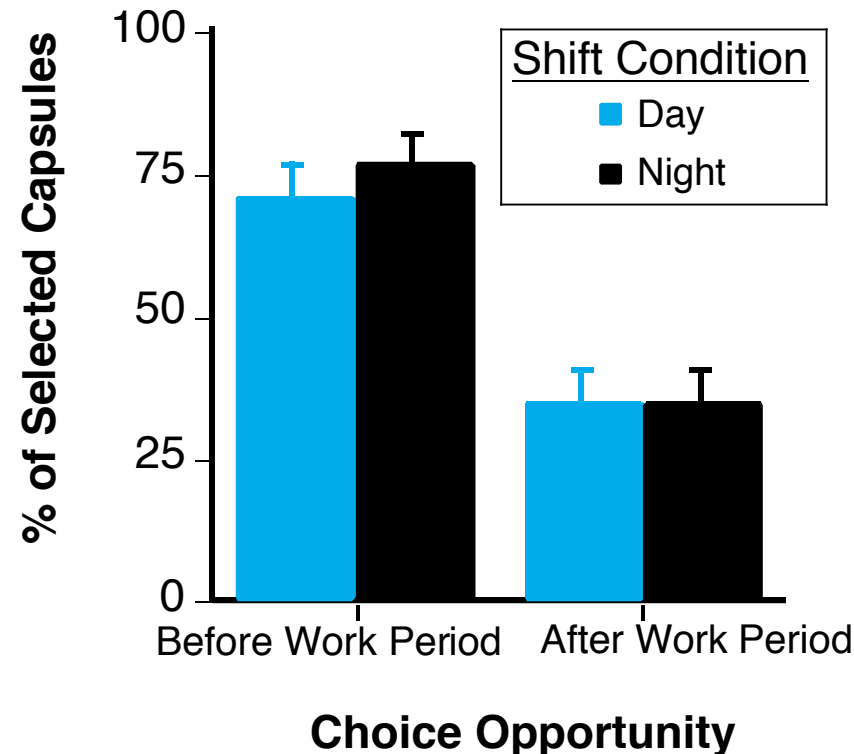
Methamphetamine self-administration by humans subjected to abrupt shift and sleep schedule changes

**Matthew G. Kirkpatrick • Margaret Haney •
Suzanne K. Vosburg • Sandra D. Comer •
Richard W. Foltin • Carl L. Hart**

ORIGINAL INVESTIGATION

Methamphetamine self-administration by humans subjected to abrupt shift and sleep schedule changes

Matthew G. Kirkpatrick • Margaret Haney •
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FINDINGS

The Rational Choices of Crack Addicts

By JOHN TIERNEY

Published: September 16, 2013

Long before he brought people into his laboratory at [Columbia University](#) to smoke crack cocaine, [Carl Hart](#) saw its effects firsthand. Growing up in poverty, he watched relatives become crack addicts, living in squalor and stealing from their mothers. Childhood friends ended up in prisons and morgues.

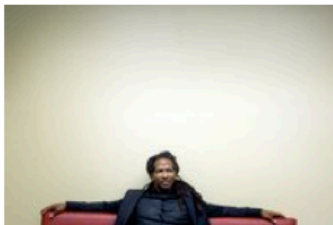
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Béatrice de Géa for The New York Times
Carl Hart, an associate professor of

Those addicts seemed enslaved by crack, like the laboratory rats that couldn't stop pressing the lever for cocaine even as they were starving to death. The cocaine was providing such powerful dopamine stimulation to the brain's reward center that the addicts couldn't resist taking another hit.

At least, that was how it looked to Dr. Hart when he started his research career in the 1990s. Like other scientists, he hoped to find a neurological cure to addiction, some mechanism for blocking that dopamine activity in the brain so that people wouldn't succumb to the otherwise irresistible craving for cocaine, heroin and other powerfully addictive drugs.

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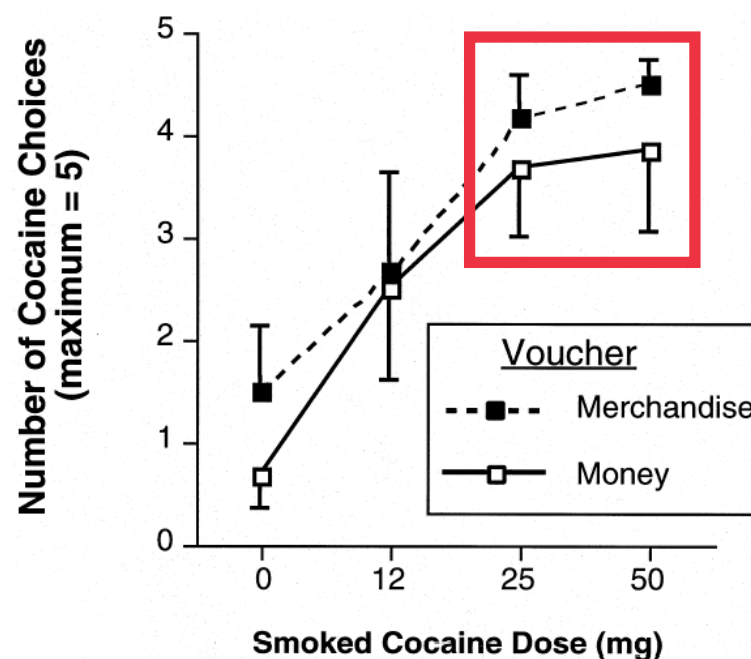
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REPRINTS



Alternative reinforcers differentially modify cocaine self-administration by humans

C.L. Hart, M. Haney, R.W. Foltin and M.W. Fischman

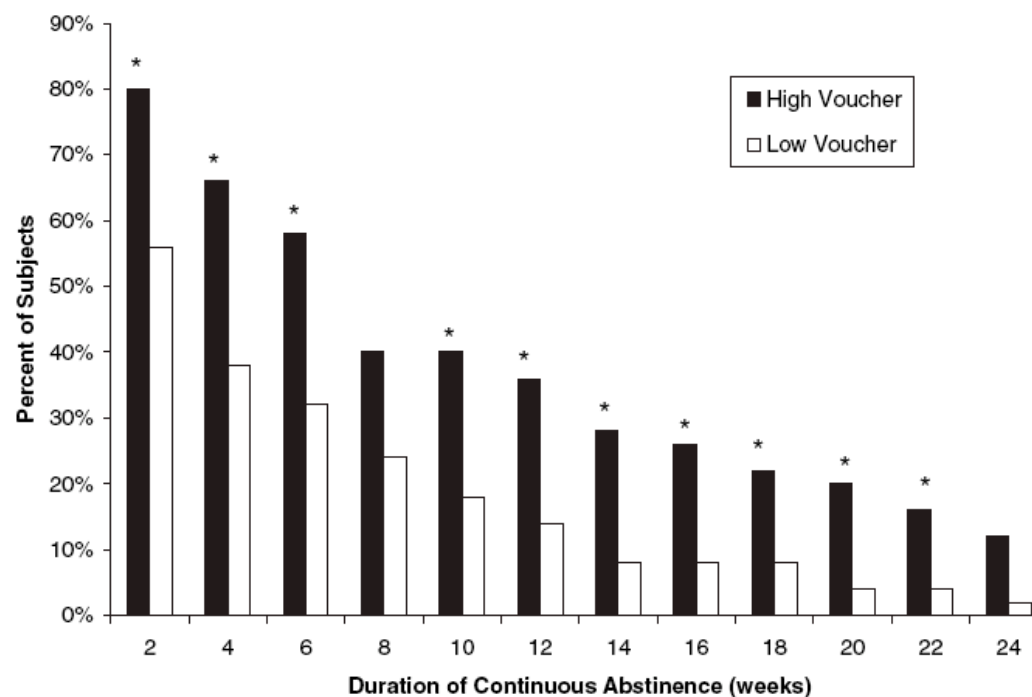
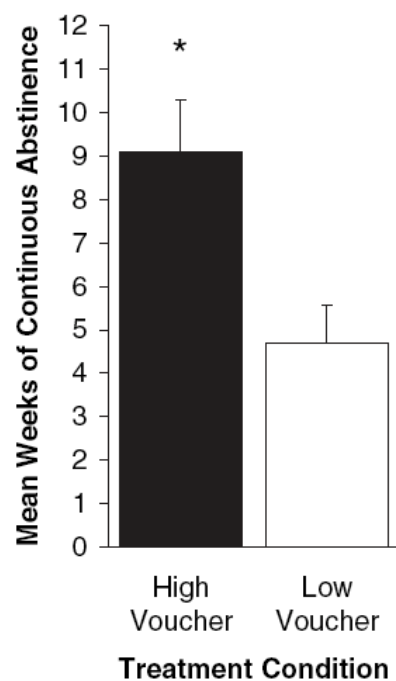


Alternative Reinforcers: Clinical Data

Effects of varying the monetary value of voucher-based incentives on abstinence achieved during and following treatment among cocaine-dependent outpatients

Stephen T. Higgins^{1,2}, Sarah H. Heil^{1,3}, Robert Dantona¹, Robert Donham¹, Martha Matthews¹ & Gary J. Badger³

Departments of Psychiatry¹, Psychology² and Medical Biostatistics³, University of Vermont, Burlington, VT, USA

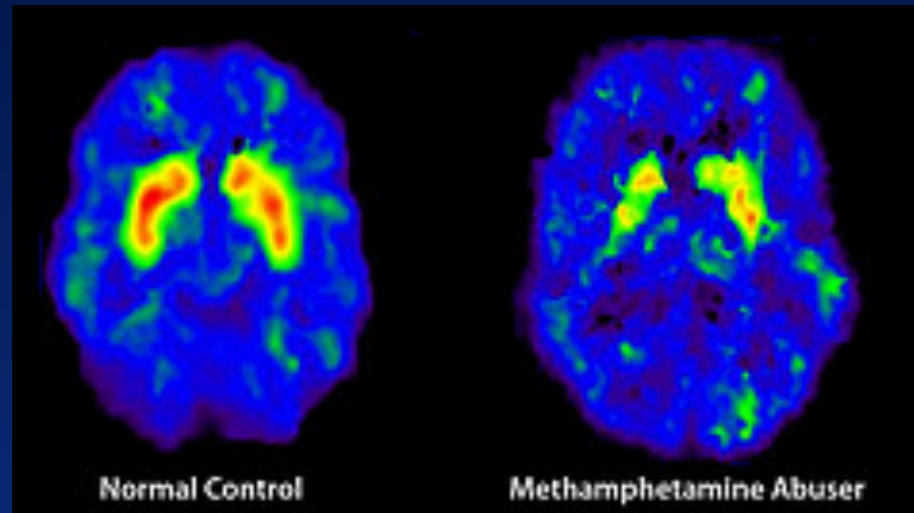


A Reinforcement-Based Therapeutic Workplace for the Treatment of Drug Abuse: Three-Year Abstinence Outcomes

Kenneth Silverman, Dace Svikis, Conrad J. Wong, Jacqueline Hampton,
Maxine L. Stitzer, and George E. Bigelow
Johns Hopkins University School of Medicine

- **Integrates abstinence reinforcement contingencies in an employment setting**
- **Participants' salary used to reinforce drug abstinence**

Methamphetamine causes brain damage



Review

Is Cognitive Functioning Impaired in Methamphetamine Users? A Critical Review

Carl L Hart^{*1,2,3}, Caroline B Marvin¹, Rae Silver^{1,4,5} and Edward E Smith^{1,6}

¹Department of Psychology, Columbia University, New York, NY, USA; ²Division on Substance Abuse, New York State Psychiatric Institute and Department of Psychiatry, College of Physicians and Surgeons of Columbia University, New York, NY, USA; ³Institute for Research in African-American Studies, Columbia University, New York, NY, USA; ⁴Department of Psychology, Barnard College of Columbia University, New York, NY, USA; ⁵Department of Anatomy and Cell Biology, Columbia University, New York, NY, USA; ⁶Division of Cognitive Neuroscience, New York State Psychiatric Institute and Department of Psychiatry, College of Physicians and Surgeons, Columbia University, New York, NY, USA

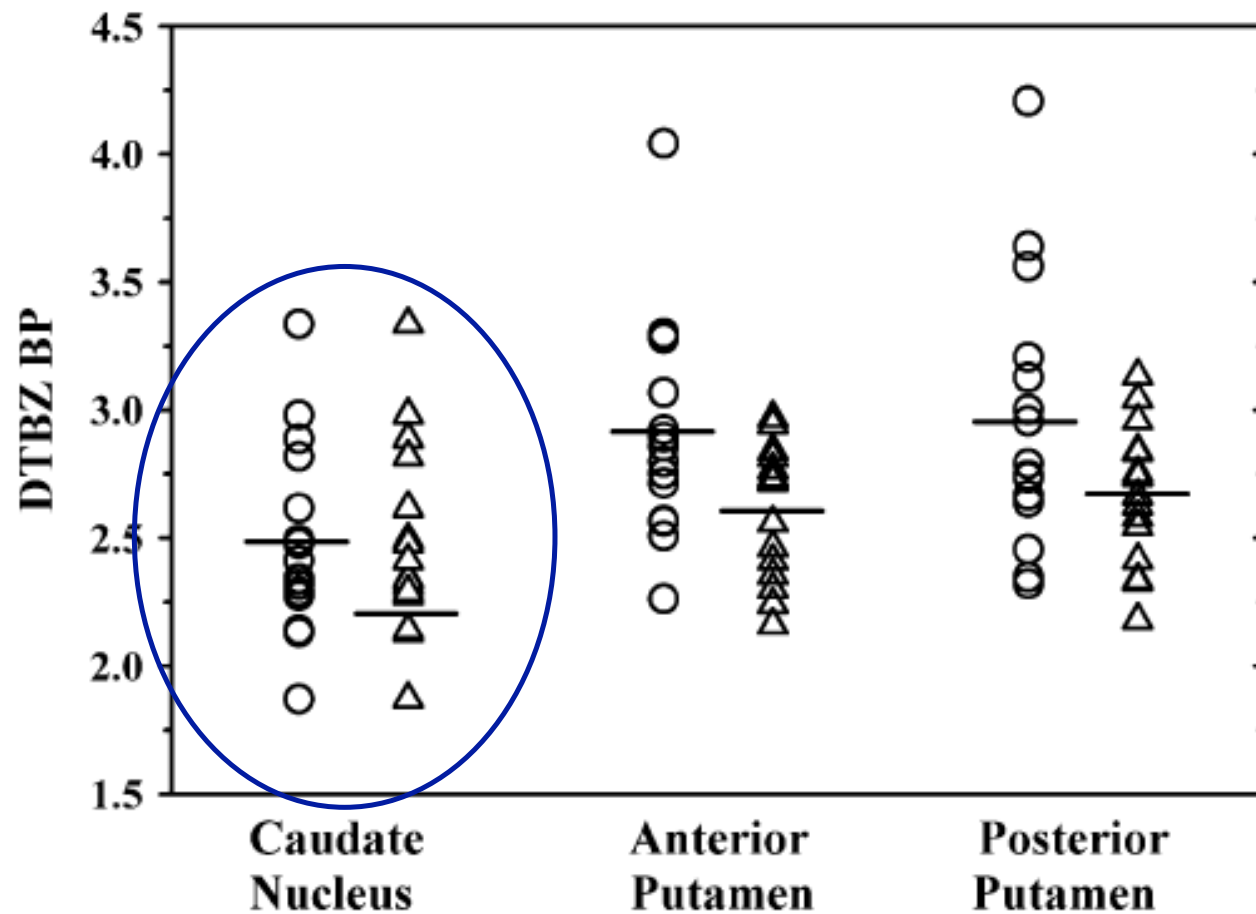


Fig. 1 Scatter plot of [^{11}C]DTBZ binding potential in the caudate nucleus and anterior and posterior putamen. The *open circles* represent individuals in the control group ($n=16$) and *triangles* represent individuals in the methamphetamine group ($n=15$)

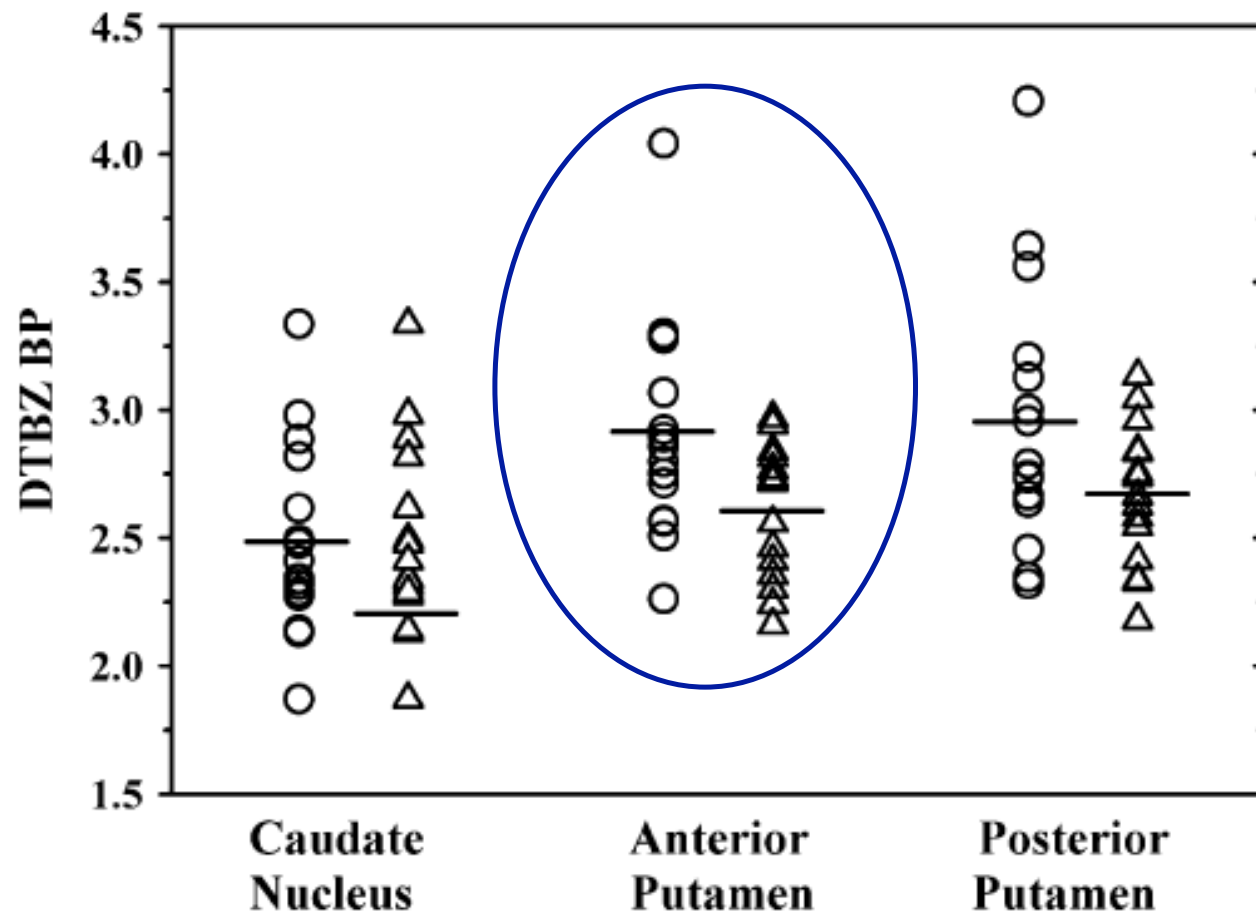


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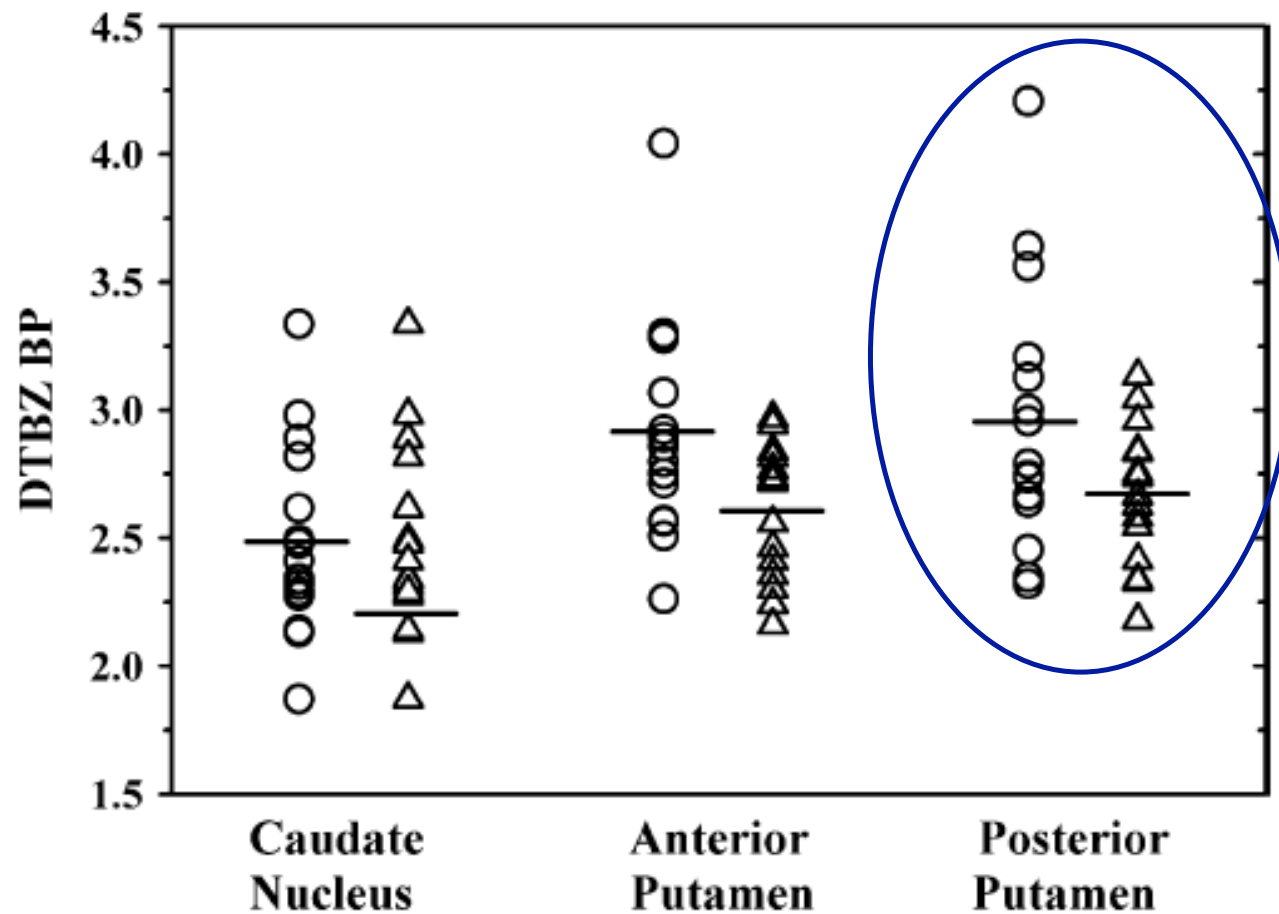
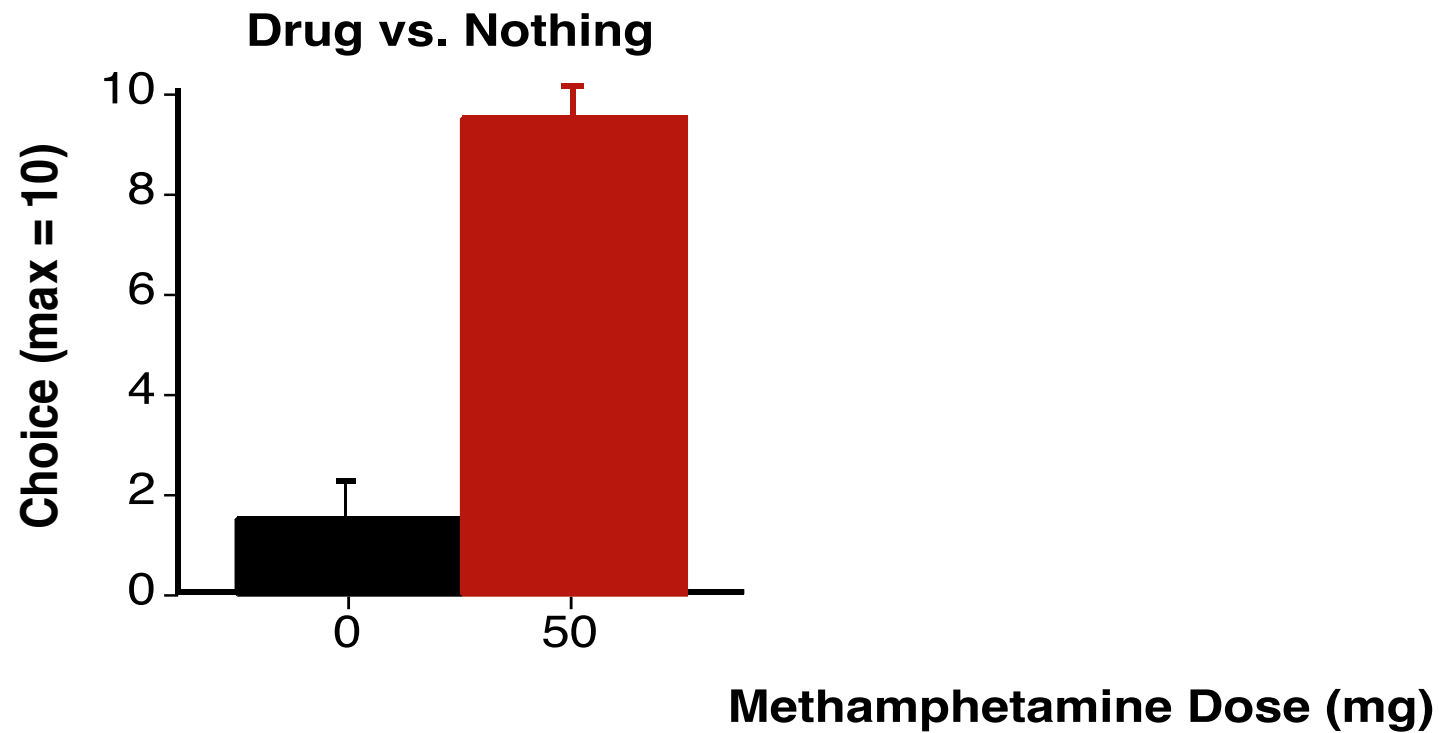


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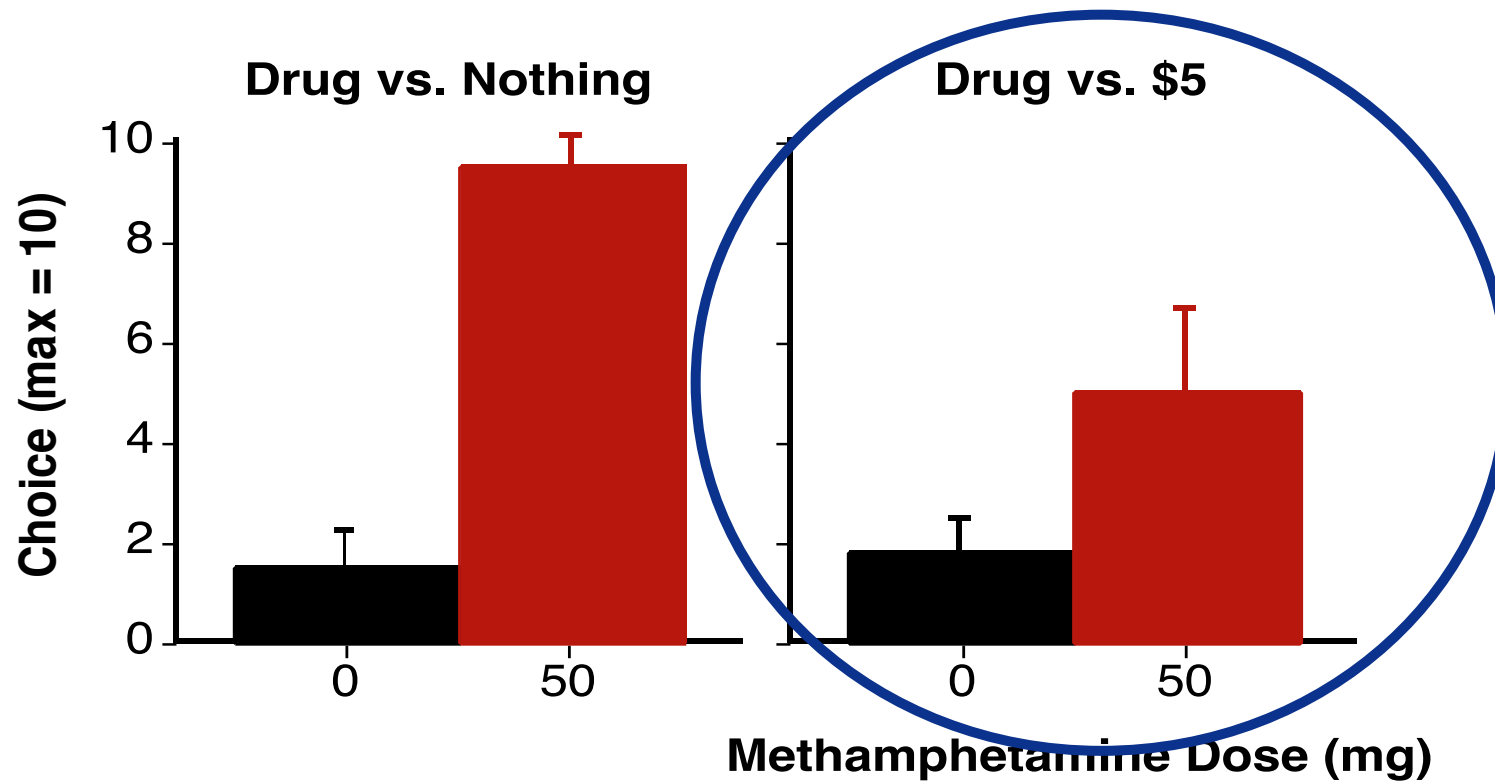
Summary of cognitive findings

- **Overwhelmingly impairment not demonstrated**
 - Despite “brain changes” and exaggerated claims in the literature

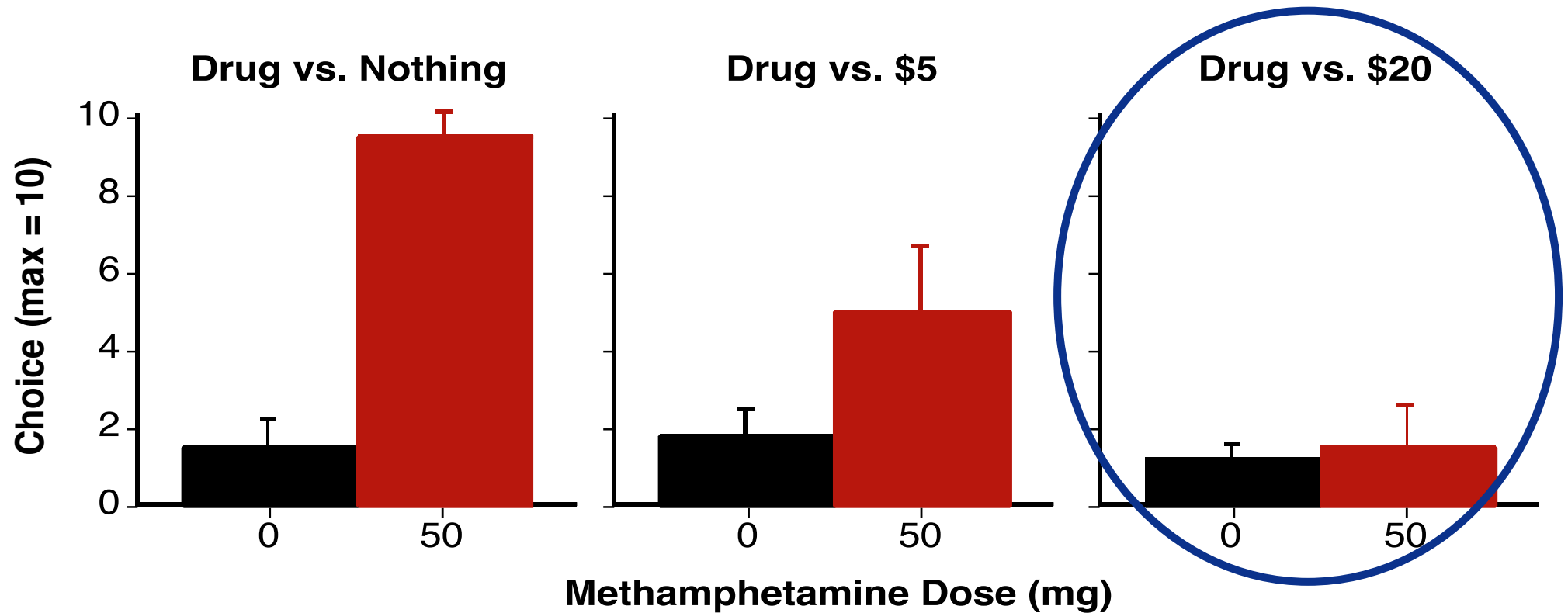
...no alternative, they'll take drug every time



...drug-taking behavior become more malleable



...drug-taking behavior is abolished



Take-home Message

- **Neuroscience approaches useful in guiding medication development**
 - But the promise may have been oversold
- **Drug users behave rationally**
 - Environmental manipulations effective at altering their behavior
- **Findings underscore the importance of the basics**
 - Dose
 - Route of administration
 - User's experience (set)
 - Environment (setting)