

Introduction

• Excessive Risky Decision-Making is a hallmark of addiction.

• The Risky Decision Making Task (RDT) reveals individual variability in risky decision-making.¹

• Risk-taking rats in the RDT show characteristics common in addiction.

- Increased cocaine seeking – Mitchell 2014
- Increased Nucleus Accumbens shell (NAcs) D1 receptor expression³
- Diminished Dorsal Striatum D2 receptor expression³

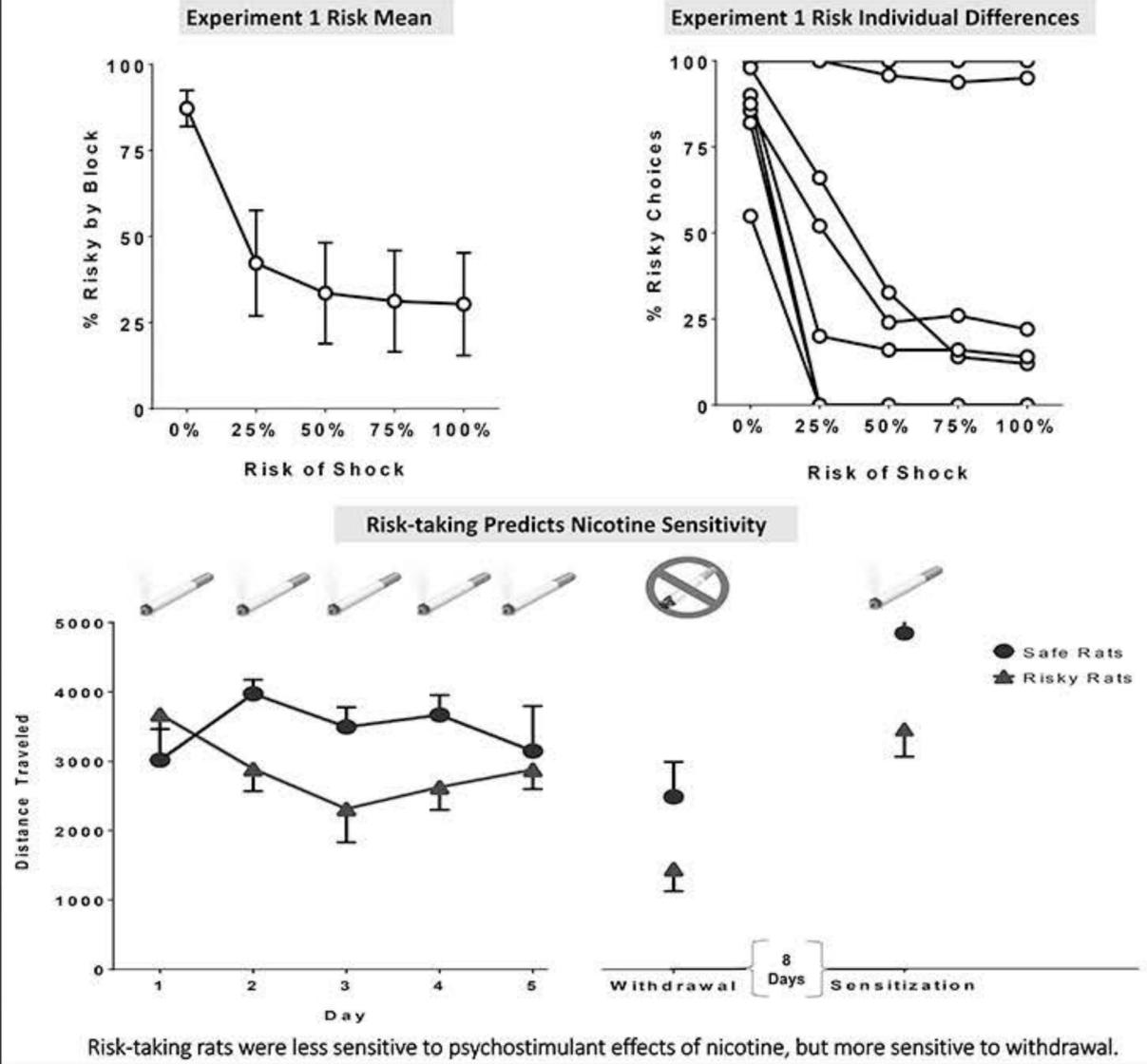
• This experiment examined differences in NAcs dopamine release and nicotine sensitivity through two questions:

- Does the risk-taking subpopulation demonstrate sensitivity in psychostimulants?
- Does Dopamine release and availability in the NAcs differ as a function of risk-taking?

• Long-Term Aims:

- To understand the behavioral and biological bases of addiction vulnerability to identify at-risk individuals
- Help facilitate therapeutic intervention prior to the onset of addiction.

Experiment 1 Results



Risky Decision Making



Experiment 1

Risk taking and Nicotine Sensitization

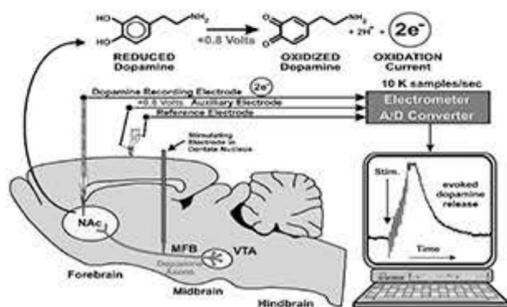


After being characterized in the RDT, the rats' sensitivity to nicotine was measured using a behavioral sensitization protocol ran in an open field chamber.

Data referenced from (4).

Experiment 2

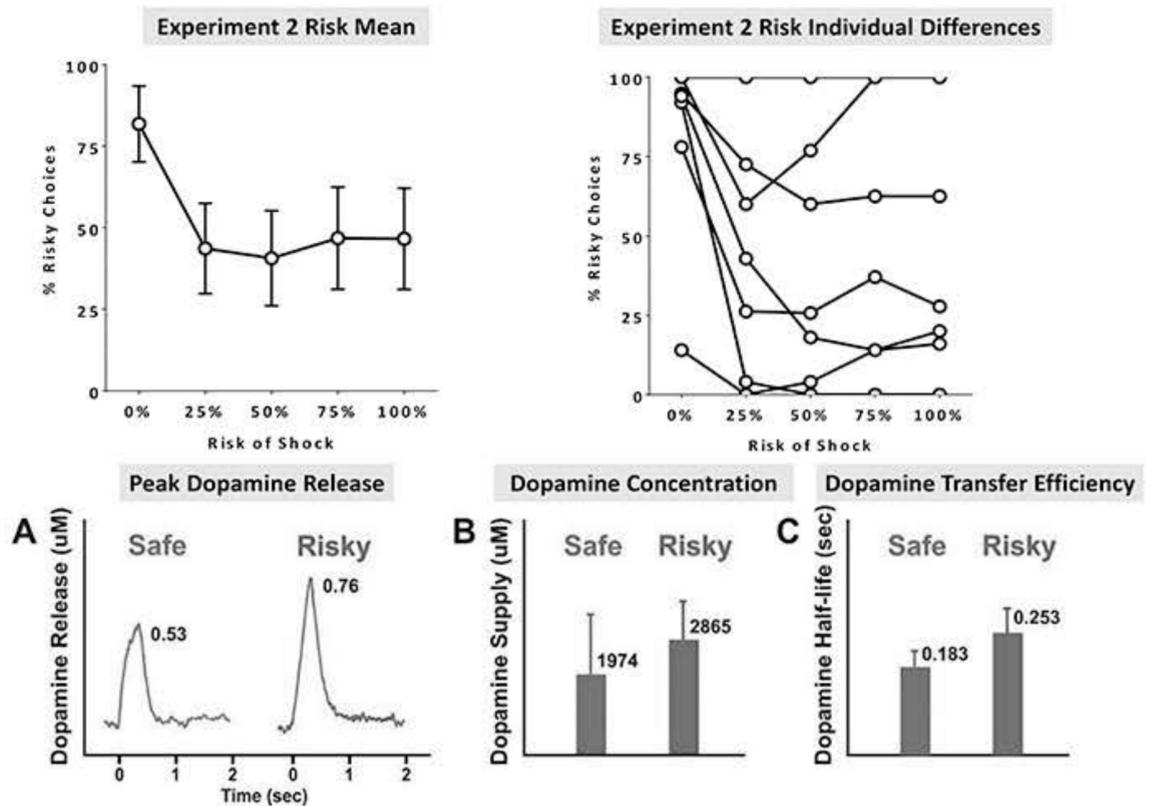
Amperometry



After being characterized in the RDT, the release of dopamine in the Nucleus Accumbens shell was measured in risk-taking and risk-averse rats.

Figure modified from (5).

Experiment 2 Results



Risky rats showed increased stimulation-evoked dopamine release, greater dopamine supply, and longer dopamine half-lives

Conclusions

Experiment 1

- The increased severity of nicotine withdrawal may mean that risk taking individuals are more susceptible to addiction due to the greater negative side effects of cessation of drug intake.
- The decreased sensitivity to nicotine in risk-taking rats may imply that risk taking individuals require more of a psychostimulant to experience the same effects as non risk-taking individuals.

Experiment 2

- Risk-taking rats exhibit increased NAcs dopamine transmission, suggesting hypersensitivity to reward.

These data suggest that risk taking rats identified in the RDT may be more vulnerable to addiction formation than the general population.

References

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3. Simon NW, Montgomery KS, Beas BS, Mitchell MR, LaSarge CL, Mendez IA, Banuelos C, Vokes CM, Taylor AB, Haberman RP, Bizon JL, Setlow B (2011) Dopaminergic Modulation of Risky Decision-Making. *J Neurosci* 31:17460–17470
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5. Dugast, C., Saud-Chagny, M. F., & Gonon, F. (1994). Continuous in vivo monitoring of evoked dopamine release in the rat nucleus accumbens by amperometry. *Neuroscience*, 62(3), 647–654.

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