



# How Many Injections of Nicotine can a Rat Anticipate in One Day?

Lauren Harold<sup>1</sup>, Andrea G. Gillman<sup>2</sup>, & William Timberlake<sup>2</sup>  
<sup>1</sup>Department of Psychology, & Sociology, Tuskegee University  
<sup>2</sup>Department of Psychological and Brain Sciences, Indiana University Bloomington



## Introduction

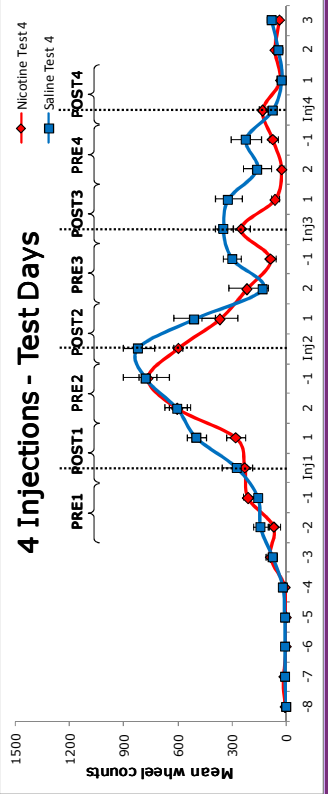
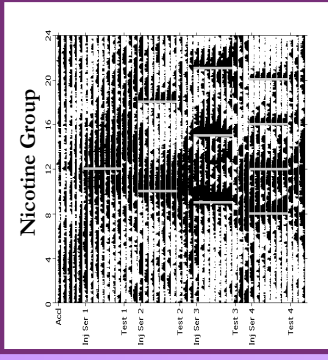
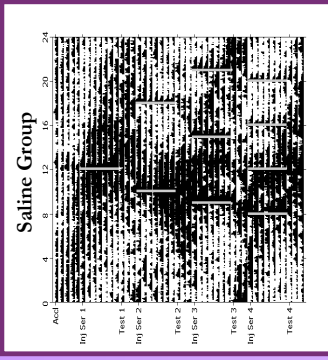
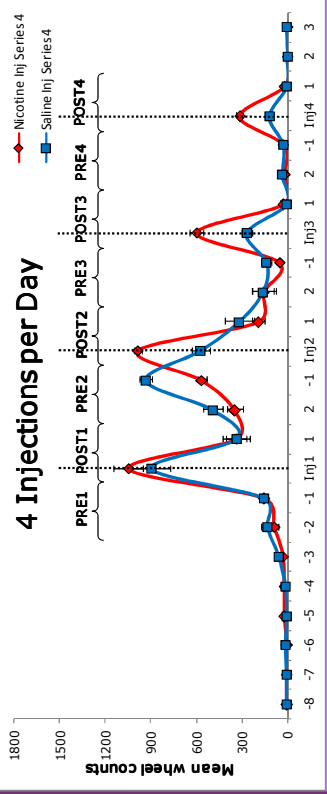
Past studies have confirmed that, in rats, repeated drug administration on a 24 hour schedule produces drug anticipatory activity that is similar to food anticipatory activity, meaning that rats show anticipatory running 1-2 hours prior to the administration time in the absence of all other cues (1). However, these studies were using only single daily administrations of the drug. The multiple injection model used in this study was an effort to create a more realistic drug schedule that could be further applied to actual addictions. Based on the results of studies with food, we expect that the rats will be able to anticipate up to 2 injections per day(2).

## Methods

Subjects were sixteen 60-day old female Sprague-Dawley rats housed in separate Med-Associate chambers. The control group received a 0.9% NaCl solution injected subcutaneously in the dorsal region. A 1.0 mg/ml nicotine solution was used in the nicotine group and was also given subcutaneously in the dorsal region. All phases consisted of 7 days of injections followed by a 3-day test period. Each phase began with one injection per day and increased consecutively until four injections were reached.

## References

1. Kosobud, A.E.K., Pecoraro, N.C., Rebec, G.V., & Timberlake W. (1998). Circadian activity precedes daily methamphetamine injections in the rat. *Neuroscience Letters*, 250, 99-102.
2. White, W. & Timberlake, W. (1995). Two meals promote of rat food-anticipatory and rest-activity rhythms. *Physiology & Behavior*, 57, 1067-1074.
3. Daniel, T., Jeanson, R., & Foutoun, Y. (2003). Temporal pattern in consumption of the first drink of the day in alcohol-dependent persons. *Chronobiology International*, 20, 1093-1102.
4. Jarvik, M., Killen, J.D., Vandy, A., & Fortmann, S.P. (1993). The favorite cigarette of the day. *Behavioral Medicine*, 16, 413-422.



## Results

For all statistical tests performed similar results were obtained for the original wheel counts and for the percentage of total daily wheel running. Due to these similarities, only the results of the wheel counts data are included here except where noted. An alpha level of .05 was used for all statistical tests. Through the analysis of the pre- and post-injection activity demonstrated in the injection phases and in the test days, the results from the study indicated that the rats can anticipate at least 4 daily injections under the conditions in the study.

## Conclusions

- Rats can anticipate up to 4 injections per day
- There is adequate support for the theory that the first drug administration is the most important (3&4)
- The anticipation is not a result of the Food Anticipatory System which can only account for two anticipatory oscillations
- More studies are needed to discriminate the effects of the injections versus the drug, and to also determine the total amount of anticipations in a day.

## Acknowledgements

Special thanks to everyone involved with the work and mechanics behind this project.