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DEPARTMENT OF PSYCHOLOGY

Developing a brain connectome for reward loss: assessing c-Fos expression in response to consummatory and Pavlovian models of frustration

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Introduction

- Reward loss is accompanied by a stress response affecting emotion and health.
- A comprehensive map of brain activity, or connectome, during an episode involving reward loss remains to be worked out.
- c-Fos is a protein expressed in recently depolarized neurons and can be used as a proxy for neural activity.

General goals:

- (1) Evaluate c-Fos expression in response to a consummatory reward downshift.
- (2) Evaluate c-Fos expression in response to reward downshift in a Pavlovian model of reward downshift.

Method

•**cSNC:** Three groups of animals were trained using 32% or 2% sucrose across ten sessions. One group was downshifted from 32% to 2% on session 11. All animals were perfused after session 11.

•**pSNC:** Animals were trained with two levers in several forced choice trials in which one lever was associated with 12 pellets and the other with 2 pellets. During postshift, both levers were associated with 2 pellets. Free choice trials were given after certain sessions. One group of animals was perfused after free choice session in preshift and the other during postshift.

•**Histology:** After rats were perfused, brains were extracted to measure c-Fos using immunohistochemistry

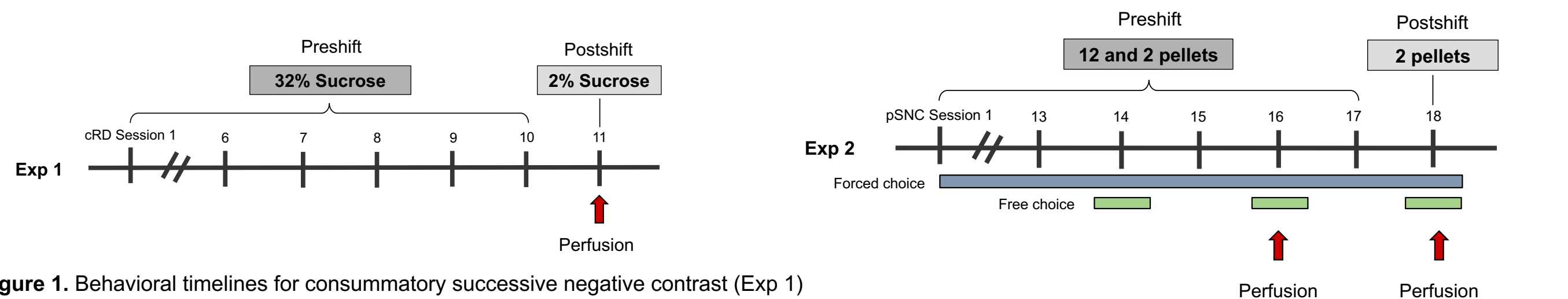
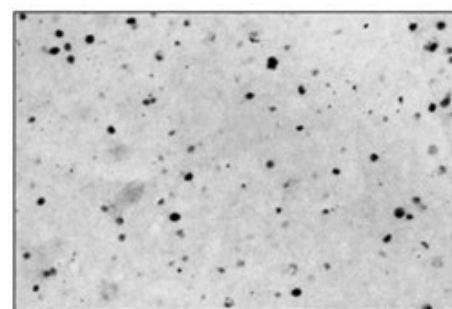


Figure 1. Behavioral timelines for consummatory successive negative contrast (Exp 1) and Pavlovian successive negative contrast (Exp 2).

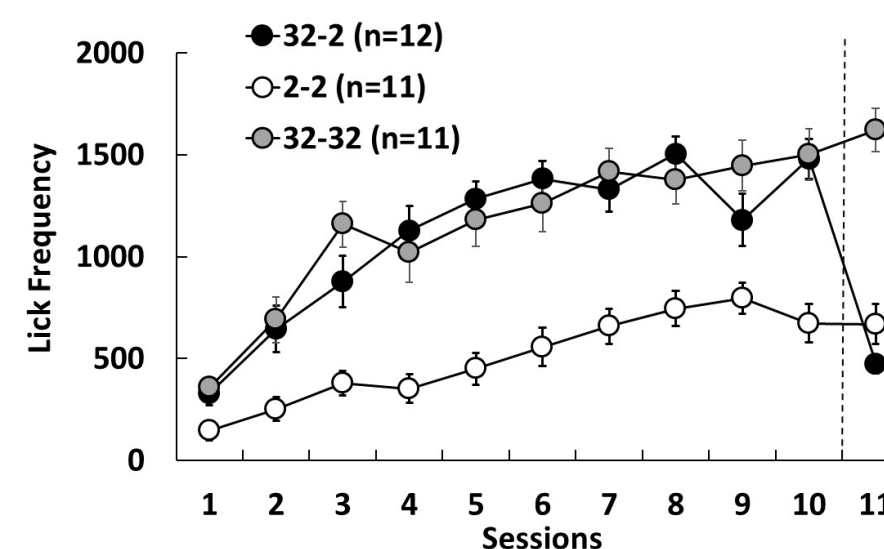


Figure 2. Lick frequency for consummatory successive negative contrast across 11 sessions.

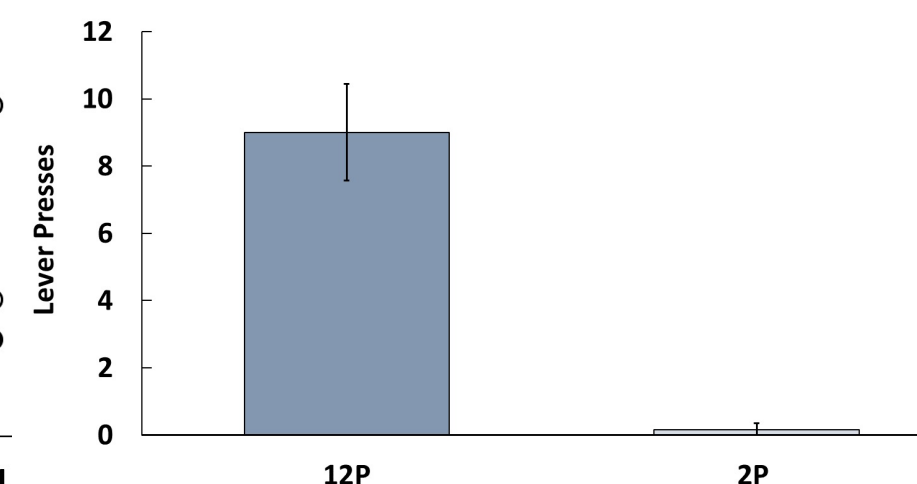


Figure 3. Lever pressing the last free choice trial during preshift before perfusion.

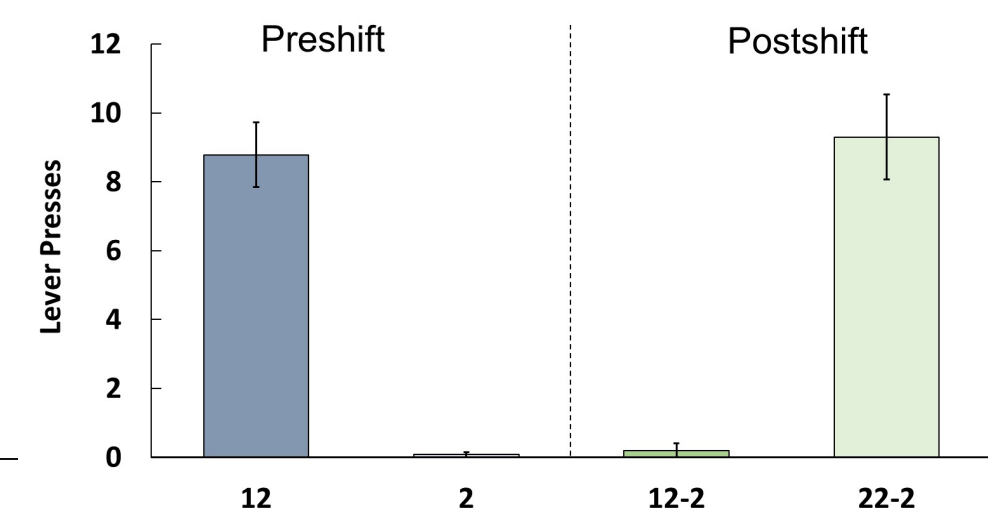


Figure 4. Lever pressing during the final free choice trial during preshift and the last free choice trial during postshift before perfusions

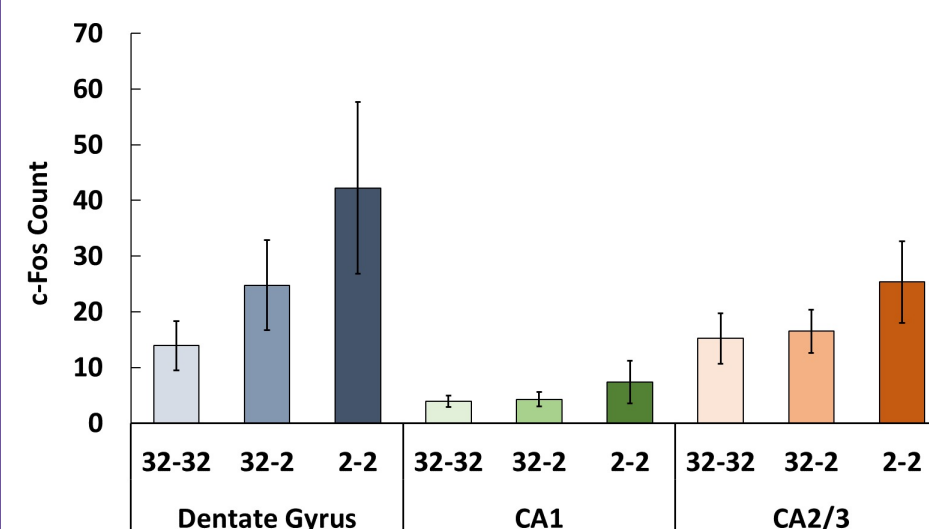


Figure 5. c-Fos counts in various regions of the hippocampus after Session 11 of consummatory reward downshift (Exp 1).

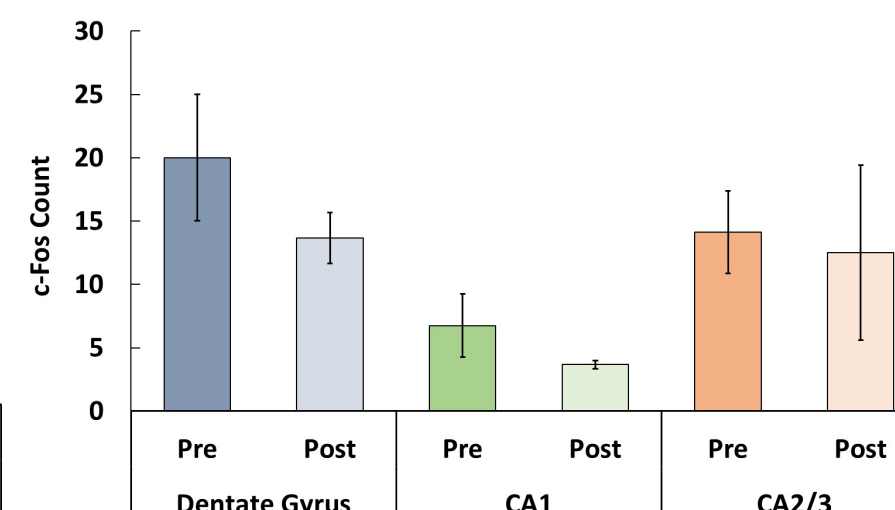


Figure 6. c-Fos counts in various regions of the hippocampus after preshift and postshift sessions of Pavlovian reward downshift (Exp 2).

Results

- Animals overall had similar expression of c-Fos between downshifted and control conditions in the hippocampus.
- 2% controls in Exp 1 had higher activity compared to 32% controls in the dentate gyrus, potentially due to animals still acquiring information about the lower value reward.

Conclusions

- c-Fos expression in additional brain areas is planned for future evaluation to continue building the connectome for frustration.