Evidence of structure and persistence in motivational attraction to serial Pavlovian cues

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Introduction

Investigations of how motivated behavior directed toward reward predictive cues (i.e. incentive salience; Berridge 2004) arises typically utilizes a single predictive cue. Yet, motivated behavior in the real world is often guided by a sequence of cues and it remains unclear how incentive salience develops toward serially presented cues. Prior work using a serial design of auditory cues found a bias in neural responding (in the ventral pallidum) toward the reward-distal cue and that changes to motivational state by way of dopaminergic or opioid drugs accentuated the reward-proximal cue response as well as the behavior (Smith et al. 2011). Others, informed by neural responding in dopamine neurons, suggest that over time responses will bias the distal cues in the sequence (Schultz et al. 1993, Collins et al. 2016). However, some learning models informed by nictitating membrane studies, suggest that the reward-proximal cue would gain the most associative strength due to a stronger prediction error (Ludvig et al. 2012). Additionally, there is reason to believe that cues in a sequence will come to be associated such that extinction of one cue results in decreased responding to specific temporally paired stimuli (Rescorla 1972, Holland and Ross 1981).

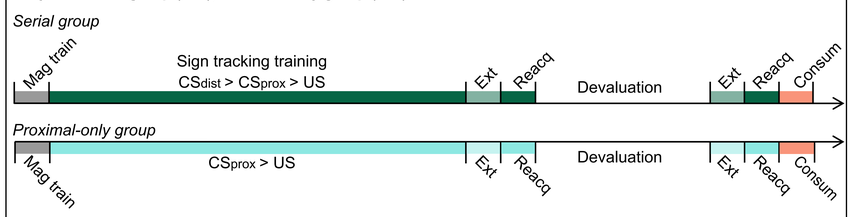
Here we sought to determine if motivated responding is biased toward one lever cue in a series, or if it would be equivalent? Further, would a change in the value of the expected reward affect responding to one cue, both, or neither?

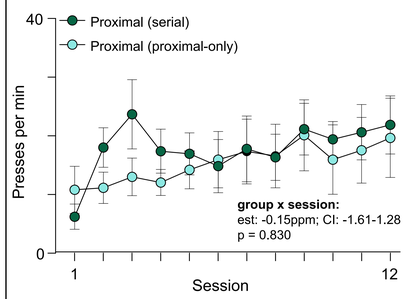
Methods & Results

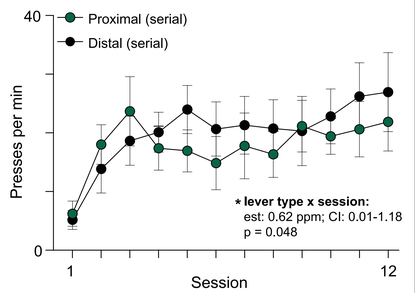
Experiment 1:

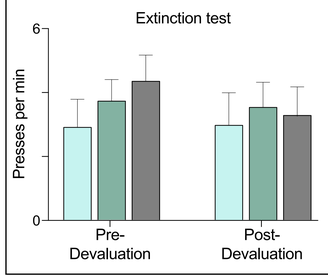
Sign-tracking to serial cues (CSdist > CSprox > US) versus traditional single reward-proximal cue (CSprox > US)

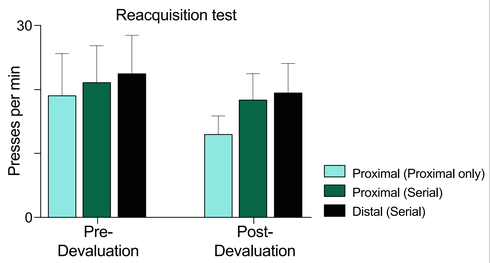
Subjects: Serial group (n=8), Proximal-only group (n=8)







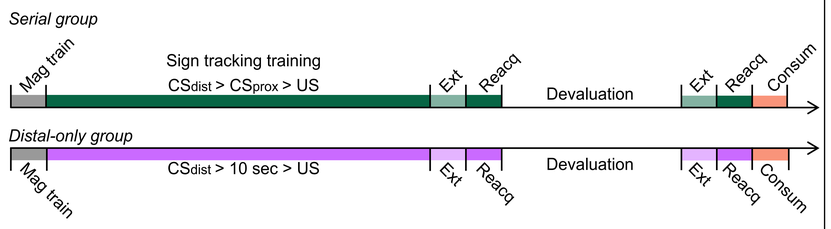


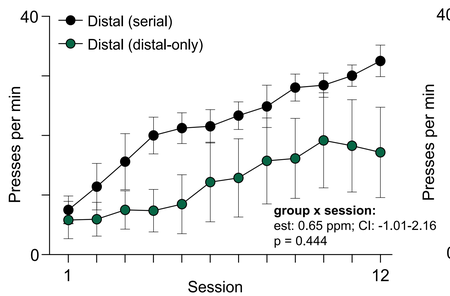


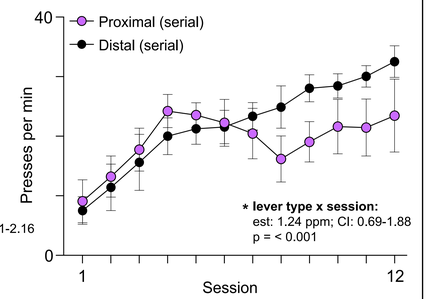
Experiment 2:

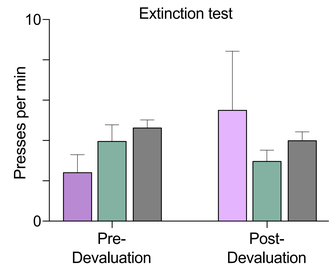
Sign-tracking to serial cues (CSdist > CSprox > US) versus traditional single reward-distal cue (CSdist > US)

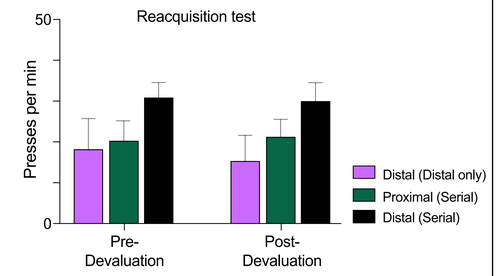
Subjects: Serial group (n=8), Distal-only group (n=8)







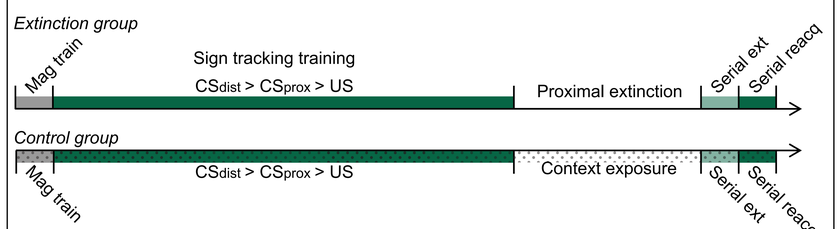


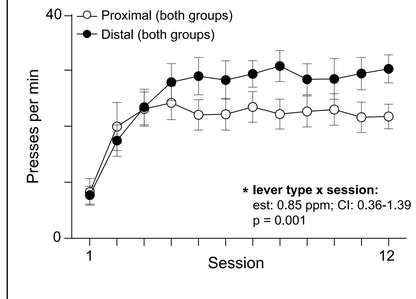


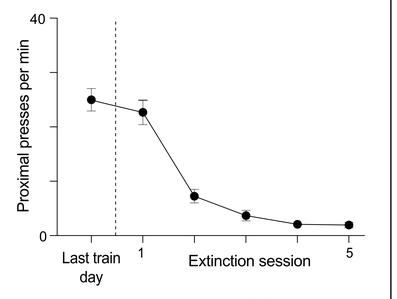
Experiment 3:

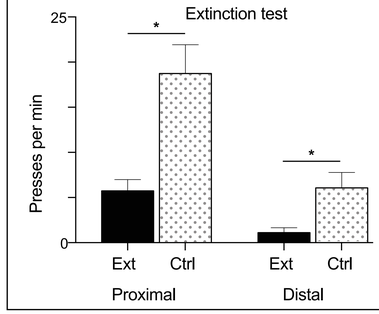
Extinction of the reward-proximal cue (CSprox) after serial training (CSdist > CSprox > US)

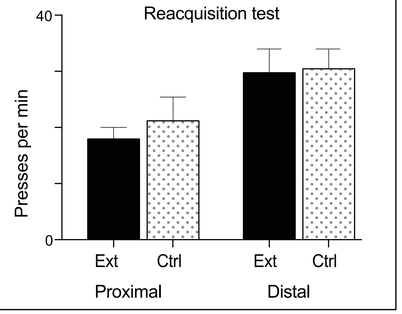
Subjects: Extinction group (n=8), Control group (n=8)











Summary Points

- In a sign-tracking paradigm that utilizes a serial lever sequence (CSdist → CSprox → US), rats will come to bias responding toward the reward distal lever and that these cues are associated to each other.
- **Experiment 1 & 2:** We show that responding to single-proximal or distal levers are not distinct from responding to sequential-proximal and distal levers, respectively. Further, we show that devaluation of reward by way of LiCl pairings does not impact post-devaluation lever responding.
- **Experiment 3:** We show that extinction of the reward-proximal cue leads to a reduction in responding toward the associated reward-distal lever in a non-rewarded session. A following rewarded session shows a quick return to similar rates of pressing toward both levers.

For more, see **Smedley EB, Smith KS (2018). Evidence of structure and persistence in motivational attraction to serial Pavlovian cues. *Learning & Memory* 25: 78-89.**

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Acknowledgements

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