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GUIDED SKILL LEARNING IN RATS IS GOVERNED BY SIMULTANEOUS FEATURE-POSITIVE BIAS

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Research Questions

Our main focus: How do learned skills sometimes become autonomous?

- How does one learn to complete a task without depending on guiding cues?

Our main question: How do guiding cues combine with practice to produce behavioral autonomy?

Introduction

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- The development of behavioral autonomy involves changes in stimulus control, by:
  - A) Environmental cues (e.g., lights)
  - B) Cues resulting from the Ss' own behavior (e.g., memory, proprioception, etc.)
- By manipulating the environmental cues, we were able to measure accuracy without the cues, i. e., behavioral autonomy.

Introduction

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- Behavioral autonomy implies rats do not depend on the guiding cues provided by the experimenter.
- If rats do not perform the task accurately without the guiding cues, then they would not demonstrate behavioral autonomy.
  - Implies dependence on the guiding cues

The Task and Guiding Cues

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The Task: Rats were trained to perform a Left-Right lever-press sequence.

- This task was the same in all conditions.

The Guiding Cues: We manipulated the onset and offset of panel lights over the respective levers.

- These manipulations varied across conditions.

Objectives

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- Exp 1 & 2:
  - Assessed control by the guiding cues after sequence accuracy was high and stable.
  - Published results seemed to be due to overshadowing: certain stimulus conditions were more controlling than others.
- Exp 3 & 4:
  - Tested this overshadowing explanation in novel stimulus conditions.

Procedure

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- In all 4 experiments, rats were trained to perform the same L-R lever-press sequence until accuracy was high and stable.
  - Criteria: 5 days of at least 85% accuracy with no trend
- All experiments compared the L-R accuracy of one condition to that of another.

Experiment 1: No-Lights Condition

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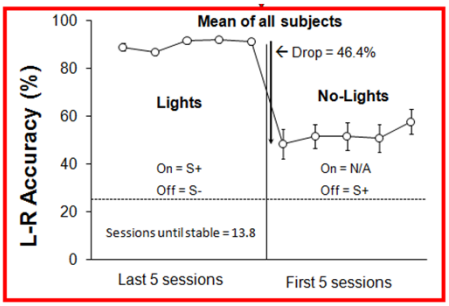

Experiment 2: Reversed-Lights Condition

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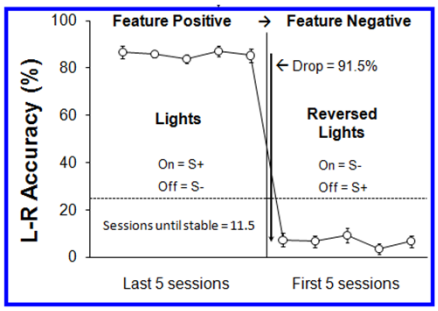

Feature-Positive Discrimination Bias

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- **Definition:** The superiority of Feature Positive over Feature Negative discrimination.
  - The presence of the light over a lever seemed to have stronger control than when that light was off.
  - Reid, Nill, & Getz (2010) explained this as overshadowing.

We tested whether this overshadowing effect was due to discrimination bias.

If so, then simply reversing the order of these two conditions should produce a very different effect.

Experiment 3: Lights Condition

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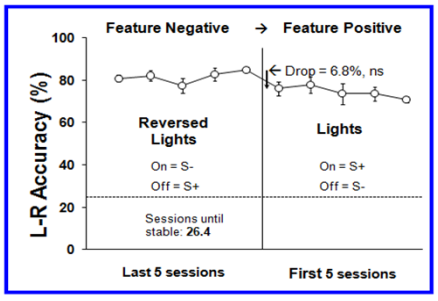

Tests the idea of feature-positive bias

Two competing explanations:

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- Was the high accuracy of Cond. 2 due to increased # sessions required to reach stability? (a practice effect)
  - Exp. 1: 13.8 days
  - Exp. 2: 11.5 days
  - Exp. 3: **26.4 days**
- Or, did feature-positive discrimination (light on) make it easier to select the correct levers in Exp. 3?

Experiment 4 controlled for the duration of training and eliminated the information provided by the cues.

Experiment 4: Both-Lights Condition

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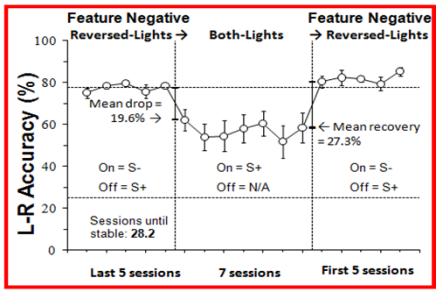

Controls for the duration of practice

Conclusion

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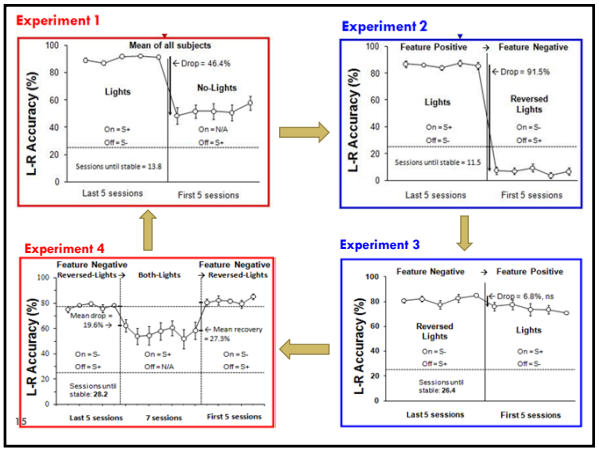
- The high accuracy in Exp. 3 was not due to practice effects:
  - Exp. 3: 26.4 days → 6.8% decrease in performance
  - Exp. 4: 28.2 days → 19.6% decrease in performance
- All changes in accuracy can be explained by Feature-Positive Discrimination Bias and practice:
  - Because Light-ON was more salient than Light-OFF, rats quickly learned to select the correct lever in Exp. 3.
  - Longer practice provided more autonomy when cue information was eliminated (compare Exp. 1 & 4).



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How do guiding cues combine with practice to produce behavioral autonomy?

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- Two sources of stimulus control exist in guided skill learning:
  - environmental cues (such as the onset of panel lights).
  - cues resulting from the subject's own behavior (allowing behavioral autonomy).
- Some cues promote behavioral autonomy more than others: All changes in accuracy could be explained by
  - (a) Feature-Positive Discrimination Bias, and
  - (b) practice

Relevant Literature:

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Hearst, E. (1991). Psychology and nothing. *American Scientist*, 79, 432-443.

Nallan et al. (1984). Transfer effects in feature-positive and feature-negative learning by pigeons. *American Journal of Psychology*, 97(4), 509-518.

Pearce, J. M. & Wilson, P. N. (1990). Feature positive discrimination learning. *JEP:ABP*, 16, 315-325.

Reid, A. K., Nill, C. A. & Getz, B. R. (2010). Changes in stimulus control during guided skill learning in rats. *Behavioural Processes*, 84, 511-515.

Sainsbury, R. S. (1971). Effect of proximity of elements on the feature-positive effect. *Journal of the Experimental Analysis of Behavior*, 16, 315-325.