

# Association Between Odor Discrimination and Cognitive Bias in Dogs

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## Background

- Domestic dogs are trained for a variety of services<sup>1</sup>
- Typically, only 63% of dogs that enter training organizations become certified<sup>2</sup>
- Odor detection accuracy in dogs is important for law enforcement and homeland security<sup>3</sup>
- Cognitive bias is used to assess responding to ambiguous stimuli associated with reward or extinction (sometimes referred to as pessimism vs. optimism) in canines<sup>4</sup>
- Dogs that are more sensitive to extinction conditions (stop responding sooner) previously showed better performance. Perhaps dogs more sensitive to reward and extinction conditions in other tests may show better performance as well.
- This research may lower the amount of resources spent on a dog less suitable for odor discrimination work.

## Aim

- Identify whether performance on a cognitive bias task is associated with tasks relevant to working dogs: an odor discrimination task
  - Hypothesis: Dogs that show high levels of “pessimism” on the cognitive bias task perform better on the discrimination task.

## Methods

### Participants

- 12 dogs from TTU Canine Olfaction Lab
- Mixed Breed and Sex

### Procedures

All dogs were tested on cognitive bias followed by odor discrimination

### Odor Discrimination Task (Figures 1, 2 & 3)

- Dogs were trained using a standardized discrete trials odor discrimination procedure<sup>5</sup>
- Dogs were trained to make a rooting response in a bin containing an almond odorant and refrain from responding to an identical bin without almond odorant.
- Experimenter bias was evaluated using no odor controls and double-blind trials
- We measured the maximum and mean accuracy for each dog

### Cognitive Bias Task (Figure 4)

- Dogs were trained in 16 trials to one side of the room as positive (baited) and the other side as negative (non-baited; extinction)
- After approaching a bowl on the positive side at least and average of .5 seconds faster than a bowl on the negative side, testing was administered
- Testing consisted of 2 sessions of 45 trials<sup>6</sup> where 18 trials were positive, 18 trials were negative, and 9 trials were ambiguous where the bowl was placed near positive (NP), middle (M), or near negative (NN). Ambiguous stimuli trials were under extinction
- Running speed to each location was measured
- The proportional difference in latency to approach the bowl was calculated by subtracting the time taken to reach an ambiguous position from the time taken to reach the positive position divided by the difference between the positive and negative position.
- Positive and negative locations in the room were switched for half the dogs

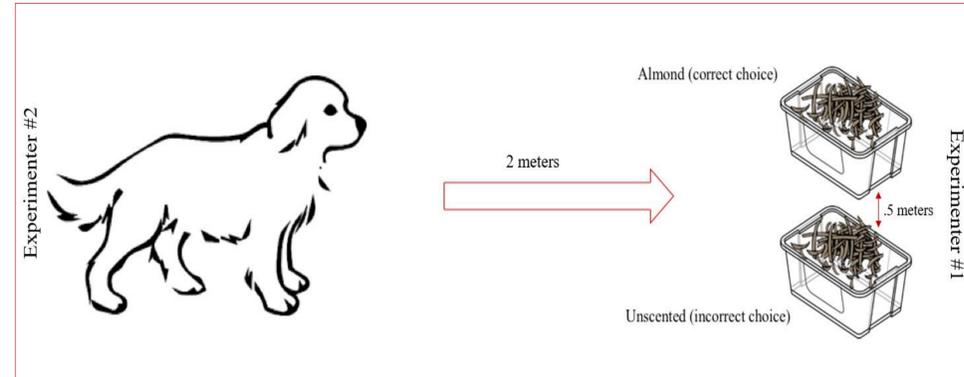


Figure 1: Layout of odor discrimination task



Figure 2: Odor discrimination task. Dog 'digging'

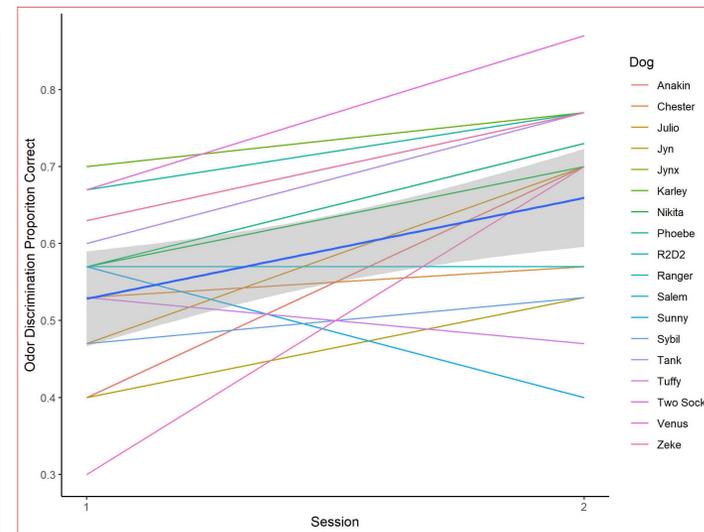


Figure 3: Performance on the odor discrimination task. Blue line shows regression line and shading shows 95% CI.

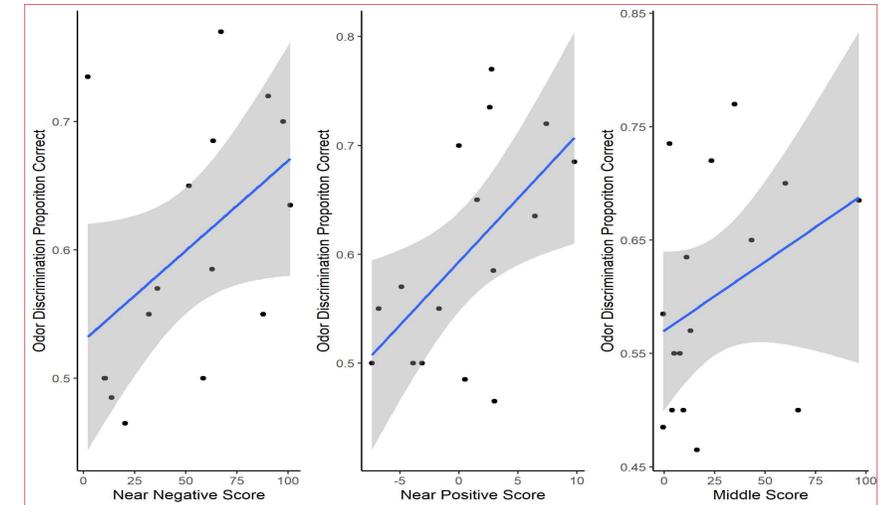


Figure 5: Regression between performance on the odor task and different locations on the cognitive bias task. Blue line indicates regression fit. Shading is the 95% CI

## Results & Discussion

- Dogs that showed longer latency to approach the near positive position performed significantly better on the odor detection task (estimate= 0.0011,  $t=2.67$ ,  $p=0.02$ )
- Dogs that showed longer latency to approach the near negative position tended to perform better on the odor detection task (estimate= 0.0014,  $t=1.98$ ,  $p=0.067$ )
- Approach to the middle position seemed less related to odor discrimination performance (estimate=0.0012,  $t=1.38$ ,  $p=0.19$ ).
- Perhaps the “pessimism” bias better reflects a contingency sensitivity. Dogs that more quickly learn that positions other than the positive are not reinforced are also more apt at the odor discrimination task.
- Further work is exploring this relationship with our previous finding with resistance to extinction

## References

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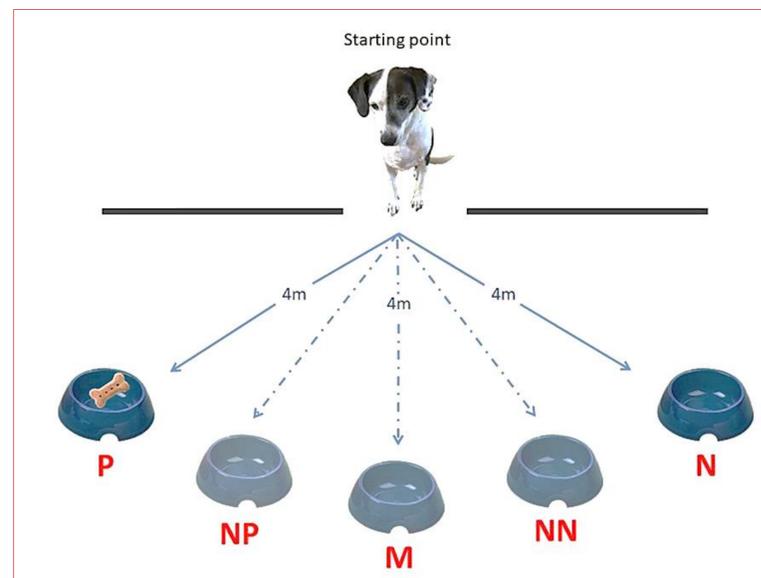


Figure 4: Cognitive bias task. Outline of the bowl positions