The Influence of Sex & Temperament on Spatial Learning in Domestic Dogs

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INTRODUCTION

Background research

•The hippocampus is cited as often being responsible for spatial navigation (Pearce, Good, Jones, & McGregor, 2004).
•The sex of subject can impact the proficiency on a spatial learning task (Bimontea, Hydea, Hoplighta, & Denenberga, 2000).
•Temperament may be associated with emotional reactivity (Davidson, 1998).

Research purpose

•The current study aimed to assess how sex and temperament may effect spatial learning in both male and female dogs, as measured by a spatial task, developed by the researchers, in a diamond shaped layout.
  •The spatial task was utilized to measure spatial learning and memory within subjects.

Hypothesis

•Male dogs would complete the task with more proficiency than female dogs.
•Obedient temperament dogs would complete the task with more proficiency than dogs with an aggressive, fearful, or excitable temperament.

Dependent Measures

•*Learning*: Percent correct container choices
•*Working Memory (errors)*: Approaches to already baited containers
•*Reference Memory (errors)*: Approaches to never baited containers

METHOD

Subjects

•*N* = 37 (Males = 16; Females = 21)
  •Ranged from 6mo – 9.08 yrs of age (*M* = 3.00, SD = 2.80)
  •All temperaments were observed (*obedient* = 9, *aggressive* = 12, *fearful* = 10, *excitable* = 6)

Materials

•Informed consent
•Liability Waiver
•Dog Demographics
•C-BARQ™ (Hsu & Serpell, 2003)
•Dog treats
•Campus map
•iPad
•Coding sheet
•Test stimuli: six plastic food containers with three food containers baited with a dog treat (see Apparatus)

All procedures were approved by the Stephen F. Austin State University Institutional Animal Care and Use Committee (IACUC) and Institutional Review Board (IRB) prior to testing.

METHOD

Apparatus

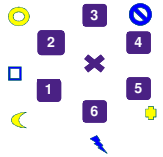

Figure 1. Layout of the Canine Appetitive Spatial Task.

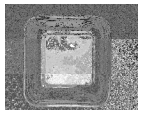

Figure 2. Test stimuli.

Procedure

Owners signed up through SONA or email with the researcher.
↓
Informed consent, liability waiver, then dog demographics and the C-BARQ™ on Qualtrics.
↓
The owner was read a set of detailed instructions.
↓
Owner took the dog out of the room (and provided dog with a treat) while the researcher placed treats.
↓
10 minute trial (see Trial Example)
↓
Walk
↓
Process was repeated until all 6 trials were completed.
↓
Owner was given feedback and certificate

Trial Example

Prior to a trial, the researcher would place the food reinforcement into the test stimuli.
The dog would be walked to the center of the room (marked by X) and then allowed to roam freely.
The dog would have a total of 10 minutes to find the containers with food reinforcers.
If not found within 10 minutes, the trial would end; there would be a total of 6 test trials.

Figure 3. Side view of testing room with cues in place.

RESULTS

•Results of a mixed-model repeated measures (RM ANOVA) with learning as the dependent measure revealed a significant main effect of Trial, $F(5,145) = 9.427$, $p < .001$.
•Results of a mixed-model repeated measures (RM ANOVA) with learning as the dependent measure revealed a significant main effect of Temperament, $F(1,29) = 4.099$, $p = .015$.
•Results of a mixed-model repeated measures (RM ANOVA) with working memory as the dependent measure revealed a significant main effect of Trial, $F(5,145) = 5.561$, $p < .001$.
•No other significant differences were observed, however a trend was noticed for the Sex x Temperament interaction for female dogs.

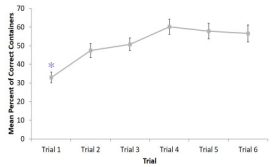

Figure 4. Mean percent of correct container choices across all 6 trials. Significantly different from trial 2-6.

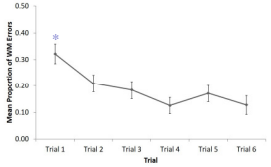

Figure 6. Mean proportion of errors in working memory across all 6 trials. Significantly different from trial 2-6.

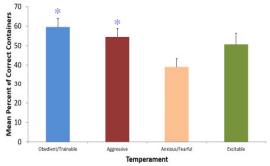

Figure 5. Mean percent of correct container choices across temperaments. Significantly different from anxious/fearful.

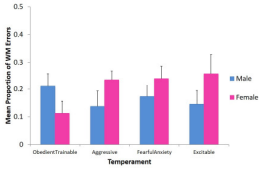

Figure 7. Mean proportion of errors in working memory across temperament for both male and female dogs (ns).

* **indicates p < .05**

DISCUSSION

Conclusions

•There was a significant difference in trial for learning and working memory, but not for reference memory.
•There were no significant differences between male and female dogs on the task.
•Obedient and aggressive dogs had higher proficiency on the task than fearful dogs.

Implication

•Findings may better help training with service dogs (e.g., K-9).
•Findings may help with the further development and validation of the task.

Limitations

•Ceiling effects.
•No systematic approach to ending trials (letting dogs finish exploring before removing them), which may have interfered with establishing reference memory.
•Odor cues.
•Dog treat satiation.
•Associative learning style; cues not being used.

Future Research

•Look into obtaining more representative sample size for ages in dogs.
•Implement a true experiment design by using probe trial (e.g., take spatial cues away during trial 6).
•Look into recording dog size as a measure.

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ACKNOWLEDGEMENTS

Dr. Robert Polewan, Dr. Nathan Sparkman, Dr. Scott Drury, & Dr. Ginger Kelso
Owners and their dogs

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