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The Influence of Human Facial Obstruction on Canine (Canis familiaris) Begging Preferences

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Abstract

Research on the ability of dogs (*Canis familiaris*) to recognize human attentional states has shown that dogs are inconsistent in successfully begging to humans who can see them. The current study expanded on this research in relation to the ongoing pandemic and analyzed whether dogs preferred begging to masked, unmasked, or blindfolded individuals. We recruited dog owners from a small liberal arts college and the surrounding area. Dogs chose to beg for a treat from a researcher in one of three separate testing conditions: no facial occlusion versus blindfolded, masked versus blindfolded, or no facial occlusion versus masked. The study found that dogs would nonsignificantly beg to individuals without a blindfold and showed no preference to individuals with either no facial occlusion or a mask. Training was not correlated with canine ability in recognizing human attention states, and attachment was not correlated with completion of the study. However, there was a significant positive correlation between attachment and success across trials. Future research will focus on increasing the power of the study and analyzing the ability of shelter dogs to recognize human attention.

Keywords: canine begging, visual obstruction, awareness, COVID-19, theory of mind

The Influence of Human Facial Obstruction on Canine (*Canis familiaris*) Begging Preferences

The gray wolf (*Canis lupis*) evolved into our modern-day dogs (*Canis familiaris*) over 12,000 years ago. Vonholdt and Driscoll (2017) provide an overview of the process by which dog domestication may have occurred. As humans migrated to new continents, we brought our canine companions with us, so that today, they can be found on every continent but Antarctica. We have aided each other through cooperative hunting, mutual protection, and emotional support, so dogs are now only rivaled by cats as the most popular pet in Western cultures. Vonholdt and Driscoll propose that our close bond to dogs first developed due to selective breeding of wolves with desirable traits, the most important one being tameness. When these traits were selected for over many generations, wolves became domesticated. The wolves we chose to breed underwent biological changes that strengthened their bond to humans. In this way, we created a mutualistic relationship: both humans and our new dogs benefitted from being in contact with each other. If dogs and humans have a mutual relationship, then it would benefit the dogs to be sensitive to human behavior, like gaze. Dogs may be sensitive to human body language due to their genetic selection for tameness, and there also may be a role of learning across each dog's life history. Past literature has provided evidence for the relative impacts of genetics and life history on dogs' sensitivity to attentional state. I will review these studies to establish a clearer view of what it means to be a dog, and more importantly, what they can comprehend of human behavior.

Comparative animal studies have looked from the lens of both the evolutionary and lifetime perspectives to examine nonhuman animals' abilities to use the information provided by humans' gaze. In comparing other species to our canine companions, we can learn about the evolutionary and social differences they have. A foundational study conducted by Miklósi et al. (1998) compared the abilities of rhesus monkeys, chimpanzees, and dogs in using direction of gaze to find food. The experimenters posed the question of whether a human looking towards hidden food would be enough to alert the animal test subject to its location. The researchers found that rhesus monkeys were unable to use human gaze direction to find the hidden food, but chimpanzees and dogs were successful in the task. However, compared to chimpanzees, dogs were able to use a wider range of human cues such as bowing and glancing movements. The researchers argued that these results showed our closer genetic relative, the chimpanzee, was successful in completing the task because of their genetic similarity to humans. However, dogs were more successful at the task due to their intimate social relationship with humans that was developed over many generations (i.e., genetic domestication). The rhesus monkeys, it seemed, missed out on both advantages.

Soproni et al. (2001) also compared the ability of dogs and chimpanzees to recognize human communicative signs, but they additionally compared these results to those of human children. Their study was very similar to Miklósi et al. (1998), in that the test subjects were presented with two locations to find food, with their only clue to the location of the food being given by the experimenter's gaze and pointing cues. They found that when presented with a range of various human gaze and pointing cues, dogs and children performed more similarly, and successfully, in the behavioral task compared to chimpanzees. The researchers argued the success of dogs compared to the chimpanzees was due to the social routines dogs have acquired through their close contact with humans (Soproni et al., 2001). These results agree with the Miklósi et al. (1998) experiments in that dogs and chimpanzees can successfully use human-generated informational cues. However, the interpretations contrast because Soproni et al.

conclude that dogs and human children performed similarly because of their social inter-species bond formed during the dogs' lifetimes, whereas Miklósi et al. emphasized genetic domestication as the reason for dogs' successful use of human cues.

Bugnyar et al. (2004) took this interspecies comparison a step further when they found that hand-reared ravens could follow human gaze direction. Bugnyar et al. presented the ravens with the task of following human gaze around obstacles. They set up their testing room in the shape of a triangle, with a human experimenter, a raven, and food in each of the corners with the raven and food being separated by a barrier. The experimenter then gazed directly at the food, while the view of the food was obstructed from the raven. This experimental design tested whether the birds would recognize the need to move around the barrier to see where the human was looking. If the ravens looked around the barrier, as opposed to looking right at it, this would support the idea that they could follow human gazing cues. They found that the ravens were highly successful in recognizing the need to follow human gaze around obstacles that obstructed their view. However, they discovered that the ravens would perform with more success at the task when they were older, around six months of age, than when they were still fledglings, at roughly two months of age. This result supports the idea of individual learning across the animal's lifetime being an important factor in recognizing human visual awareness.

Interestingly, whereas Bugnyar et al. found developmental differences among ravens, Agnetta et al. (2000) did not find developmental differences among canine test subjects. Agnetta et al. presented dogs with novel cues (e.g., marker dots) to aid them in finding hidden food in a behavioral task. Their research found that dogs were able to use novel cues to find hidden food, but only when the cue was accompanied by some form of human behavior (gazing and/or marker placing). The dog was reliant on human behavior to aid their discovery of the food, regardless of whether they had been exposed to the different cues before. Most importantly, Agnetta et al. found that the success of the dogs in their testing trials did not change with age from four months to four years of age. This, the researchers argued, supported the theory of dogs' having an evolutionary predisposition to recognize human behavior. Comparing this research to that conducted by Bugnyar et al. (2004), the dogs maintained their abilities regardless of age, whereas the ravens learned across their individual lifetimes.

Udell at al. (2008) also researched dogs' attending to human and nonhuman cues. They presented their test subjects with either a human-given cue, such as pointing, or a nonhuman equivalent, like a doll or robot pointing, to help them find hidden food. They found that even though dogs could attend to various stimuli and images, the dogs were far more sensitive to human gestures than they were to cues generated by nonhuman equivalents. Their study was similar to that of Agnetta et al. (2000), where they either presented the dog with a cue including a human behavior, or a cue without. However, the Agnetta et al. study compared human cues to nonanthropomorphic cues, like a marker dot, while Udell et al. compared anthropomorphic cues. This study offered a more nuanced view of how strong the need is for human behavior to accompany a cue for canine recognition to occur, regardless of whether humans view the cues as interchangeable.

As reviewed, a number of studies have shown that dogs successfully use human-generated cues to make decisions. Another question researchers asked was "how" and "why" this was possible. Somppi et al. (2011) addressed this question through their use of eye tracking in their canine research. The researchers presented the test subject with four separate categories of images: dog, human, item, or letter. They discovered that dogs would look more readily to areas of an image that showed important identifying information. When presented with various categories of images, the research found that dogs would look at images of other dogs more often compared to non-dogs, as well as other familiar humans or objects compared to unfamiliar items. The researchers believed this was an indicator of the dogs' natural interests, especially because they completed the task with no prior training. This adds understanding to the idea that dogs focus on the essential aspects of human attention, like the specific cues a human offers, while disregarding extraneous information.

Most canine behavioral studies have been conducted using novel researchers to reduce the chance of bias for a familiar owner. However, Bolló et al. (2021) studied how dogs perceive their owner's faces. They presented dogs with a choice to approach either a picture of their owner facing them, or picture of their owner facing away. They found that the dogs approached the forward-facing owner at a higher rate. Interestingly, both pictures of the owner came with an equal presentation of food, so Bolló et al. asserted that the dogs' choices were a result of their owner acting as a social reward. It seemed to the researchers that a bond forms between humans and dogs across their lifetime that acts as a motivator in canine choice preferences. The researchers also found that the dogs' choices in the behavioral task were unaffected by which side the pictures of their owners were presented on and unrelated to their choice latencies.

Dogs are clearly capable of using human attention to aid them in retrieving food. Dogs' sensitivity to human attention was further investigated in the "forbidden food task" (Call et al., 2003), which studied what dogs do when they can tell a human is *not* paying attention to them. In this task, an experimenter placed food on the floor, announced "don't take it," then say the dog's name before repeating the command. The dogs were tested in many different conditions, including when the experimenter turned their back, did a distracting task, left the room, or watched them from a chair (control condition). Dogs were more likely to attempt to take the food when the experimenter was not visually aware (back turned, distracting task, left the room) compared to when they were still watching. Call et al. (2003) believed the tendency of dogs to perform these acts was a result of their abilities gained throughout evolution and across their individual lifetimes.

Braüer et al. (2004) also looked at dogs' performance on the forbidden food task, and they expanded on Call et al. (2003) by introducing barriers to the dogs. They found that in addition to the dogs recognizing when humans were more visually aware, so they could more successfully steal forbidden food, they were also successful in identifying effective and ineffective barriers that would create a lack of visual awareness in the experimenter. They were able to distinguish between features of the barrier that had the potential to make them more or less effective, like their size or the presence of a window (Braüer et al., 2004). Their results were similar to those of the Bugnyar et al. (2004) raven studies, with both species being able to recognize the importance of a barrier in the environment. It appeared that dogs could use their abilities to obey or disobey human commands, which they did with clear and intentional purpose.

The current study drew heavily from the research of Udell et al. (2011) on canine sensitivity to human attention. Udell et al. compared the abilities of wolves and dogs in discriminating human attentional states. They gave canids choices between experimenters who were looking at the dog versus experimenters who were (across conditions): back turned, reading a book, looking through a camera, or had a bucket over their eyes. Dogs were more successful in identifying a lack of human awareness when researchers had their backs turned or were reading a book than when they had cameras or buckets over their eyes. This means that the dogs were more successful in this discrimination when presented with familiar stimuli. In particular, dogs equally approached people who did and did not have a bucket on their heads. Udell et al.

concluded this was evidence that dogs needed experience with facial obstructions in order to understand their meaning.

Purpose of the Present Study

During the COVID-19 pandemic, dogs gained experience with a new kind of facial obstruction: surgical masks. In the current study, I hoped to determine whether surgical masks affect dogs' ability to identify human visual awareness. I hypothesized that surgical masks would not affect dogs' perception that a human is attending to them. In order to investigate this question, I compared dogs' likelihood of approaching experimenters with either a surgical face mask worn over the nose and mouth, a surgical mask worn over the eyes as a blindfold, or no facial occlusion. I made two predictions. First, I predicted dogs would be able to identify the visual occlusion (the blindfold) and choose to instead beg for a treat from a researcher that did not have a visual occlusion (mask or nothing). Second, I predicted the dog would be just as likely to approach a researcher wearing a facemask over their face as they would be to approach a researcher with no facial covering, showing a familiarity to facemasks that has developed due to the ongoing pandemic. I was also interested in the potential relation between sensitivity to attentional state, past training, and attachment levels.

Method

Participants

Dogs and their owners were recruited from a small liberal arts college and the surrounding community. Because dental, skeletal, and sexual maturity are reached at varying ages in canines (4-6 months, 10-11 months, and 7-21 months, respectively), the age range criterion for dogs allowed to participate in the study was set to between 1 and 10 years as a midpoint of these varying points of maturity (Geiger et al., 2016). Of the dogs tested, 36% were female, and they had a median age of 5 years. All dogs tested lived in homes where their owners primarily reported their purpose was for companionship. Dogs were either bought from breeders as puppies or adopted from local shelters by their owners. All dogs had been living with their current owner for a minimum of two months prior to testing.

Owners reported the level of training experience their dog had, as well as any specialized job they served. None of the dogs tested had specialized training certifications (i.e., guide dog, medical alert dog). Of the 25 dogs brought to the testing room, 16 completed the behavioral task. One dog refused the treat in the food motivation assessment and was therefore not tested. The eight other dogs refused to approach the experimenters.

Materials

Sessions were videorecorded and took place in a large room with tile floors and the chairs and tables removed. The treats were either a half-inch piece of hotdog or Redbarn Natural Chicken dog food roll, depending on owner preferences. One dog's owner brought their own treats due to their dog's allergies.

The first questionnaire, the Dog Owner Questionnaire, was a general-purpose tool which screens dogs for food aggression and gathers general information about their breed, training experiences, age, and living situation. The second questionnaire was the attachment subscale of the Canine Behavioral Assessment and Research Questionnaire, short version (C-BARQ; Hsu & Serpell, 2003), which assessed dogs' attachment level to their human. Dog guardians responded to six questions on a scale of zero (never) to four (always). Questions asked, for example, how often the dog "Tends to follow you (or other members of the household) about the house, from room to room."

Design

Each dog was randomly assigned to one of the three conditions in the study: In the first condition, dogs chose between an experimenter with no facial occlusion versus someone who was wearing a surgical mask over their eyes, but nothing over their nose and mouth (“blindfolded”). In the second condition, dogs chose between a person wearing a surgical face mask (“masked”) versus someone who was blindfolded. In the third condition, dogs chose between a person who had no facial occlusion versus someone who was masked.

Conditions occurred in a random order. Dogs were tested individually. The procedure required three experimenters per session, and a group of about five student researchers helped run the sessions. The experimenters were randomly assigned their roles at the start of each session, and the two experimenters presenting the binary choice switched sides of the room before the start of each trial. This means for a dog to consistently choose one experimenter, they had to alternate their chosen side across trials.

Procedure

At the start of the session, an initial treat was tossed on the floor in view of the dog to establish food motivation. If the dog did not eat the treat within 30 seconds, they were removed from the study. Dogs were restrained on leash by their owners. Two experimenters, seated in chairs, faced away from the dog at the opposite end of the space. The dog was allowed to freely wander the room while their owner filled out the questionnaires. The experimenters were instructed not to interact with the dog as the dog wandered the room but could allow the dog to smell them as the dog explored. This served as an acclimation period of about 5 minutes. Then, behavioral testing began. The dog and owner were centered on one end of the room, five meters away from the experimenters. The experimenters positioned themselves at the opposite end of the room, five meters away from each other. The head researcher moved to the corner of the room to direct the testing session. Figure 1 shows the setup of the testing room.

In order to control for scent cues, each experimenter held a treat in their hand closer to the center of the room. When prompted by the lead researcher, the two experimenters simultaneously called the dog’s name, and the owner released the dog. The dog then chose which experimenter to approach. A choice was noted when the dog walked within one meter of an experimenter. Blue tape on the floor indicated a one-meter perimeter around each experimenter. If the dog chose the “correct” experimenter, that experimenter delivered a treat. If they chose the incorrect experimenter, that experimenter did not deliver a treat. The “correct” option was defined as the experimenter who could see the dog. In the no facial occlusion versus blindfolded condition, the correct option was the experimenter who had no facial occlusion. In the masked versus blindfolded, the experimenter who was masked was correct.

In the condition no facial occlusion versus masked, I arbitrarily decided the correct experimenter was the one with no facial occlusion. I considered having both experimenters offer the dog a treat; however, in that case there would be no incentive for the dog to choose one experimenter over the other. In planning the study, I considered the possibility that I may be teaching the dogs which alternative was correct by having only one experimenter provide a treat. However, Udell et al. (2011) found no learning effect across the trials of their study, which our protocol closely replicated. Therefore, it was reasonable to conclude that there would be no learning effect in this study.

After the dog either received a treat or not, the trial reset with the owner guiding the dog back to the starting location. Ten testing trials were performed on each dog. If the dog did not approach an experimenter within 30 seconds, the lead researcher would alert the experimenters and they would again call the dog's name. This recall could take place up to five times across two and a half minutes. If the dog still had not chosen an experimenter to approach for a treat, they were removed from testing.

Results

Figure 2 shows the results of the behavioral task. A one-sample Wilcoxon signed rank test determined that dogs were indifferent between no facial occlusion and masks ($z = 1.378$, $p = .17$), which we predicted. In contrast, we predicted dogs would prefer to approach people wearing masks over people wearing blindfolds, but we did not find a preference ($z=1.841$, $p = .07$), nor did we find that dogs preferred to approach people wearing no facial occlusions over blindfolds ($z=1.841$, $p = .07$).

Dogs with higher attachment scores on the C-BARQ had more success in identifying human attention ($r = 0.655$, $p = .04$) than did dogs with lower scores, while training was not correlated with success ($r = -0.149$, $p = .68$). There was no correlation between attachment and completion of the study ($t = -1.266$, $p = .22$).

Discussion

Conclusion

My results did not show a significant difference between dogs' preferences for approaching occluded and nonoccluded humans. The direction of our results corresponded to our predictions. Although the results were underpowered, the dogs' preferences were directionally similar to the preferences of canines originally tested by Udell et al. (2011). They showed that dogs will preferentially beg from humans without a visual facial occlusion, compared to those with an occlusion.

The correlation of attachment with success in the trials was an unexpected result. There is a biological basis for the bond formed between dogs and humans. Nagasawa et al. (2015) researched this theory to explain the existence of the human-dog bond and the ability of dogs to attend to human behavior. They discovered the existence of an oxytocin-mediated positive loop that was created and maintained by gazing behavior between the two species. Essentially, when dogs would gaze at humans, humans would release oxytocin, thus leading to affiliation in the humans, which created more oxytocin in dogs as they interacted with them. This cyclic pattern, the researchers explained, was not found in wolves. These results assert that this mechanism may have aided the development and coevolution of human-dog bonding. Humans may have unintentionally picked the first dogs to breed that exhibited this oxytocin loop, in addition to the more obvious trait of tameness, without realizing the powerful effects it would have on domestication. In this way, the process of bonding with our new helpers occurred over many generations.

Golden retrievers are one of the most popular dogs in the United States. They were bred to be finely attuned to human behavior, working as hunting dogs, guide dogs, or any field job in-between (American Kennel Club, n.d.). These dogs were bred to enjoy obedience and working with, and for, humans. I anecdotally noticed that all of the golden retrievers tested successfully completed the behavioral task, which reflects research from McKinley and Sambrook (2000), who found that gundog breed performed better in attending to human-given cues.

The current study used the C-BARQ to assess canine attachment. Although the C-BARQ is commonly used, it is a relatively simplistic measure of attachment, with only four items. This study proposes the use of specific canine attachment style questionnaires in future behavioral research, similar to that used in scoring human infant attachment by Ainsworth et al. (1969/2015) in their classic experiment, The Strange Situation. This way, canine attachment can be further categorized to determine whether one attachment style is more influential to recognizing human attention states. Konok et al. (2019) proposed, but have not yet validated, a questionnaire that created four clusters of attachment to possibly predict canine separation-related disorders. Their questionnaire was inspired by the work of Ainsworth et al. (1969/2015) and would provide a good foundation for this research.

Only 64% of the tested dogs successfully completed the behavioral task, while the majority of the remaining dogs would not approach the experimenters. In the future, it would be useful to use a screening tool to identify dogs who would be more likely to approach strangers. One useful tool would be the temperament assessment algorithm to assign introversion or extroversion (Karpiński et al., 2022). Extroverted dogs would be expected to display higher levels of exploratory behaviors and boldness, which would be useful for completing behavioral studies. Another limitation was that training was difficult to quantify due to the variability used by owners with their dogs. A direct comparison of the abilities of a dog who has been trained once a week for four years, versus a dog who was trained extensively for six weeks over eight years ago and then not again, is difficult to determine. A standardized questionnaire, similar to the C-BARQ attachment scale, would be beneficial to accurately determine differences in canine training levels.

Overall, this study supported both the theories of evolution and lifetime experience acting as determinants in canine awareness of human attention. The correlation of attachment and success across the trials supports the theory of lifetime experience having a large impact, while success of golden retrievers in the trials (though not enough were tested to be significant) supports the idea of canine evolution affecting success, because retrievers were bred to attune to human behavior more than other breeds. The classic psychological idea of "Nature and Nurture" appears to apply to our canine companions as well.

Future Research

Increasing the power of the study to attain significance in the no facial occlusion versus blindfold and mask versus blindfold conditions should be the top priority. After this, testing shelter dogs would be useful in differentiating the roles of domestication versus life history in dogs' sensitivity to human attentional states. If shelter dogs perform with relatively the same levels of success as dogs with strong ratings of attachment to humans from traditional homes, then the theory of dog's attaining their understanding of human visual awareness through evolution would be supported. However, if shelter dogs perform poorly, this would support the current experiment's findings that a strong attachment to humans, grown in a dog's individual lifetime, is essential to the development of a sensitivity to human attention states.

Testing shelter dogs across their lifetimes, as they are adopted by humans and grow stronger attachment to their new families in a longitudinal study, would also offer keen insight. However, the history of these adopted dogs would be useful to have record of, as past stress and abuse can lead to later cognitive issues in humans and nonhumans (Hedges & Woon, 2010). These imparities can be combatted by the presence of an enriched environment, so one would hope that shelter dogs, given a more nurturing and engaging home, could show a reduction in these effects over time.

References

Agnetta, B., Hare, B., & Tomasello, M. (2000). Cues to food location that domestic dogs (*Canis familiaris*) of different ages do and do not use. *Animal Cognition*, *3*(2), 107–112. https://doi.org/10.1007/s100710000070

Ainsworth, M. D., Blehar, M. C., Waters, E., & Wall, S. N. (2015). Patterns of attachment. (Original work published 1969) https://doi.org/10.4324/9780203758045

American Kennel Club. (n.d.). *Golden retriever dog breed information - American kennel club*. Golden Retriever. Retrieved April 11, 2022, from https://www.akc.org/dog-breeds/golden-retriever/

Bolló, H., Kiss, O., Kis, A., & Topál, J. (2021). The implicit reward value of the owner's face for dogs. *IScience*, *24*(8), 102763. https://doi.org/10.1016/j.isci.2021.102763

Bräuer, J., Call, J., & Tomasello, M. (2004). Visual perspective taking in dogs (*Canis familiaris*) in the presence of barriers. *Applied Animal Behaviour Science*, *88*(3-4), 299–317. https://doi.org/10.1016/j.applanim.2004.03.004

Bugnyar, T., Stöwe, M., & Heinrich, B. (2004). Ravens, *Corvus corax*, follow gaze direction of humans around obstacles. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, *271*(1546), 1331–1336. https://doi.org/10.1098/rspb.2004.2738

Call, J., Bräuer, J., Kaminski, J., & Tomasello, M. (2003). Domestic dogs (*Canis familiaris*) are sensitive to the attentional state of humans. *Journal of Comparative Psychology*, *117*(3), 257–263. https://doi.org/10.1037/0735-7036.117.3.257

Geiger, M., Gendron, K., Willmitzer, F., & Sánchez-Villagra, M. R. (2016). Unaltered sequence of dental, skeletal, and sexual maturity in domestic dogs compared to the wolf. *Zoological Letters* 2016, *2*(1). https://doi.org/10.1186/s40851-016-0055-2

Hedges, D. W., & Woon, F. L. (2010). Early-life stress and cognitive outcome. *Psychopharmacology*, *214*(1), 121–130. https://doi.org/10.1007/s00213-010-2090-6

Hsu, Y., & Serpell, J. A. (2003). Development and validation of a questionnaire for measuring behavior and temperament traits in pet dogs. *Journal of the American Veterinary Medical Association*, *223*(9), 1293–1300. https://doi.org/10.2460/javma.2003.223.1293

Karpiński, M., Wojtaś, J., & Garbiec, A. (2022). Temperament assessment algorithm in dogs. *Animals*, *12*(5), 634. https://doi.org/10.3390/ani12050634

Konok, V., Marx, A., & Faragó, T. (2019). Attachment styles in dogs and their relationship with separation-related disorder – A questionnaire based clustering. *Applied Animal Behaviour Science*, *213*, 81–90. https://doi.org/10.1016/j.applanim.2019.02.014

McKinley, J., & Sambrook, T. D. (2000). Use of human-given cues by domestic dogs (*Canis familiaris*) and horses (Equus caballus). *Animal Cognition*, *3*(1), 13–22. https://doi.org/10.1007/s100710050046

Miklósi, Á., Polgárdi, R., Topál, J., & Csányi, V. (1998). Use of experimenter-given cues in dogs. *Animal Cognition*, *1*(2), 113–121. https://doi.org/10.1007/s100710050016

Nagasawa, M., Mitsui, S., En, S., Ohtani, N., Ohta, M., Sakuma, Y., Onaka, T., Mogi, K., & Kikusui, T. (2015). Oxytocin-gaze positive loop and the coevolution of human-dog bonds. *Science*, *348*(6232), 333–336. https://doi.org/10.1126/science.1261022

Somppi, S., Törnqvist, H., Hänninen, L., Krause, C., & Vainio, O. (2011). Dogs do look at images: Eye tracking in canine cognition research. *Animal Cognition*, *15*(2), 163–174. https://doi.org/10.1007/s10071-011-0442-1

Soproni, K., Miklósi, A., Topál, J., & Csányi, V. (2001). Comprehension of human communicative signs in pet dogs (*Canis familiaris*). *Journal of Comparative Psychology*, *115*(2), 122–126. https://doi.org/10.1037/0735-7036.115.2.122

Udell, M. A., Giglio, R. F., & Wynne, C. D. (2008). Domestic dogs (*Canis familiaris*) use human gestures but not nonhuman tokens to find hidden food. *Journal of Comparative Psychology*, *122*(1), 84–93. https://doi.org/10.1037/0735-7036.122.1.84

Udell, M. A., Dorey, N. R., & Wynne, C. D. L. (2011). Can your dog read your mind? Understanding the causes of canine perspective taking. *Learning & Behavior*, *39*(4), 289–302. https://doi.org/10.3758/s13420-011-0034-6

Vonholdt, B. M. & Driscoll, C. A. (2017). Origins of the dog: Genetic insights into dog domestication. In Serpell, J. & Barrett, P., *The domestic dog: Its evolution, behavior and interactions with people* (pp. 22–41). Cambridge University Press.

Table 1

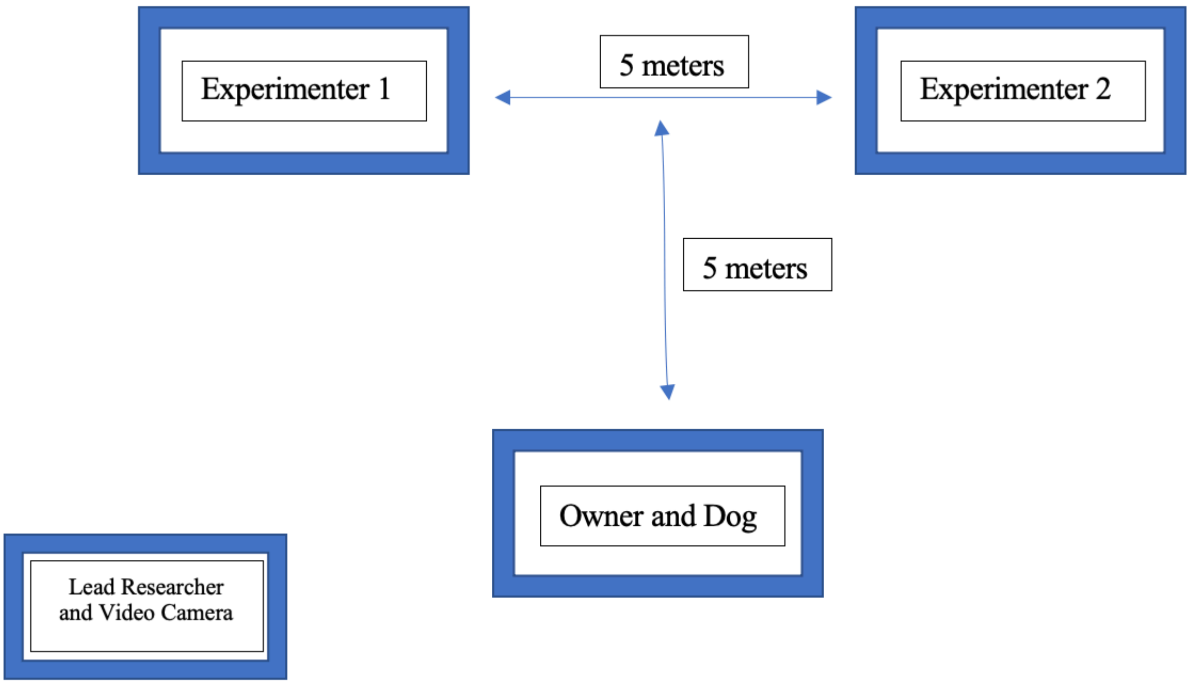
Participant Traits

Condition	Name	Age (years)	Sex	Breed
N/M	Beckett	6	M	Golden Retriever
N/M	Chewy	5	M	Samoyed
N/M	Gillie	2	M	Golden Retriever
N/M	JJ Howard	8.5	M	Pug
N/M	Lexa	5	F	Australian Shephard
N/M	Sailor	5	M	Portuguese Water Dog
M/B	Finn	5	M	Golden Retriever
M/B	Mango	1	M	Maltese
M/B	Maxie	4	F	Retriever Mix
M/B	Puné	3	M	Shichon Mix
M/B	Sydney	2.2	M	Australian Labradoodle
N/B	Finley	5	M	Golden Retriever
N/B	Hampton	3	M	Golden Retriever
N/B	Luna	5	F	Husky
N/B	Patrick	9.5	M	Labradoodle
N/B	Princess	10	F	Dachshund

Note. Female (F) and Male (M) sexes are presented. Conditions are listed as no facial occlusion versus blindfolded (N/B), masked versus blindfolded (M/B), and no facial occlusion versus masked (N/M).

Figure 1

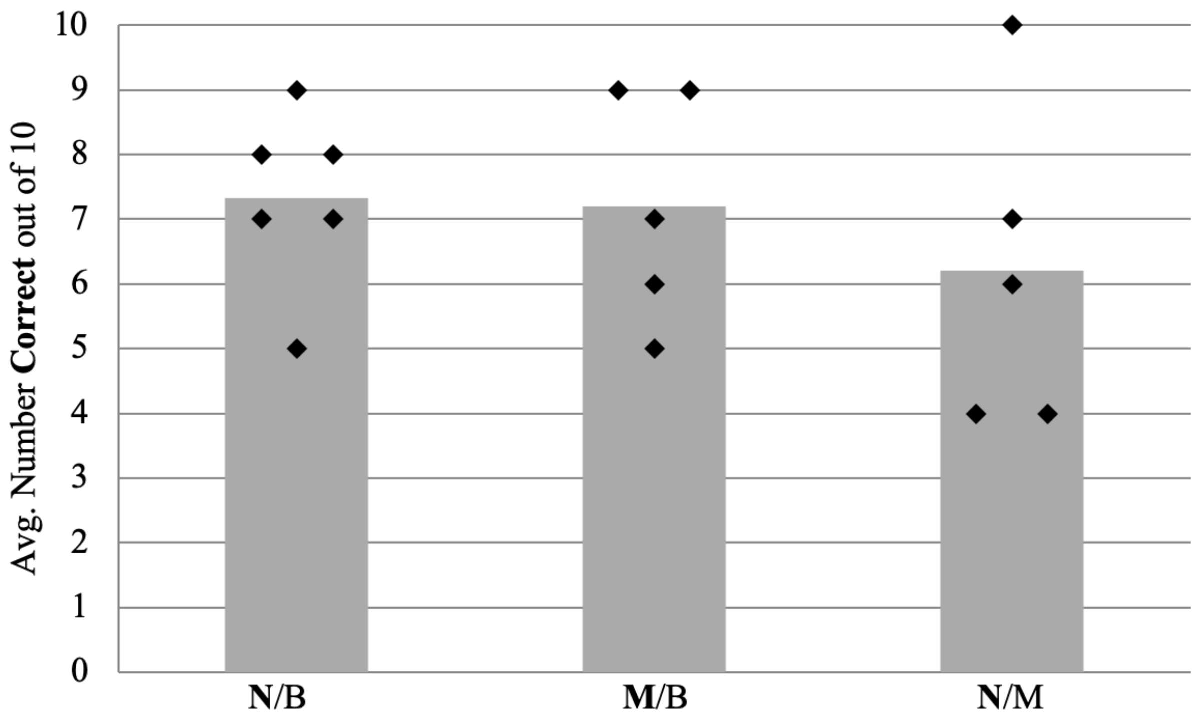
Experimental Design of Room Layout



Note. Lead researcher remained out of the canine test subject's direct field of view during testing conditions.

Figure 2

Canine Begging Preferences



Note. One-sample Wilcoxon signed-rank test for a difference from 5/10 correct (chance performance) in no facial occlusion versus blindfolded (N/B), masked versus blindfolded (M/B), and no facial occlusion versus masked (N/M). For each condition label, the bolded condition indicates the correct alternative for which the dog received a treat. Bars indicate mean performance and dots indicate individual performance.