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Domestic dogs' (*Canis lupus familiaris*) evaluation of moral and immoral actors

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Abstract

A sense of morality, or values predisposing what is right (fair, just, kind) and what is wrong (unfair, cruel, dishonest), appears universally across all humankind. All major cultures share support for some values, such as self-respect, respect for others, and ‘the golden rule’—treat others how you wish to be treated—and disdain for some sins, such as murder, theft and dishonesty (Kinnier, Kernes & Dautheribes, 2000). Some moral behaviors, such as inequity aversion, the tendency to do no harm and cooperation are found to exist in virtually all human adults. But where does morality come from? Is it uniquely human or do we share some moral values with nonhuman animals? To explore these questions domestic dogs—nonhumans with exceptional social cognitive skills—were tested for moral values through a replication of a study on moral reasoning in human infants (Hamlin & Wynn, 2011). Dogs watched a puppet show with a moral and immoral actor—the moral actor helped a neutral character achieve a goal and the immoral actor prevented the actor from achieving the goal. Dogs generally looked longer when the neutral puppet chose to associate with the moral helper than the immoral hinderer, demonstrating that dogs, like human infants, may prefer when agents associate with moral helpers. Though this is a preliminary study it suggests that a sense of morality may not be uniquely human and may be an evolved trait shared by humans and nonhumans alike.

Origins of Morality

Morality is defined as a set of values differentiating right (fair, just, kind) from wrong (unfair, cruel, dishonest) in the subject’s mind. With such a subjective definition, studies and writings on morality differ vastly. Regardless, scientists and philosophers generally agree that some sense of morality, of right and wrong, appears universally across all humankind. All major cultures uphold some common values, such as self-respect, respect for others, and ‘the golden

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rule'—treat others how you wish to be treated—and disdain for some sins, such as murder, theft and dishonesty (Kinnier, Kernes & Dautheribes, 2000). Some moral behaviors, such as inequity aversion, the tendency to do no harm, and cooperation are found to exist in virtually all human adults.

Inequity aversion is defined as a preference for fairness and a disfavor towards inequality. A classic example of inequity aversion in human adults can be seen in the ultimatum game in which player 1 has a sum of money or rewards that they divide between themselves and player 2. Player 2 can either accept the proposal, and both players will get the proposed sum, or reject the proposal, and neither player will get anything. Players are much more likely to divide the rewards in an equal or close to equal way (50/50, 60/40) than they are to divide it in a way that they or the other player would benefit significantly more than the other (i.e., 80/20; Güth, Schmittberger & Schwarze, 1982). Perhaps most impressively, players engaged in a dictator game – structurally equivalent to the ultimatum game but without the option for player 2 to decline the offer – also share rewards fairly equitably, even though player 2 cannot retaliate and reject the offers (Forsythe et al, 1994). Further, participants often opt to punish 'free-riders', people who reap benefits but do no work, in voluntary cooperation games (Fehr & Schmidt, 1999). The choice of punishing those who gained benefits with no effort demonstrates that human adults generally feel as though things should be fair and equal—those that work the hardest get the most benefits, and those that do not work get no benefit. Inequity aversion can be seen cross-culturally as well—Ugandan children preferred to distribute stickers equally to children who completed a task successfully, and were even more likely to throw away stickers rather than distribute them unequally (Paulus, 2015). The fact that no reward was more

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preferable than an unequal reward shows strong evidence for inequity aversion, even in non-Westernized societies.

Another universal trait among humans is the tendency to do no harm. Most human adults—save for some criminals—prefer not to harm others. They demonstrate the tendency to do no harm through a classic experiment—the trolley problem (Foot, 1967). Subjects were told to make a decision on a hypothetical situation: If a trolley with 5 passengers was about to crash and the only way to stop it was to sacrifice one other person, what would you do? The vast majority of participants choose to save five people over one, showing that, generally, people want to cause the least amount of harm when possible. To further support this, people in the study were more likely to pull a lever to save 5 and harm 1 than to actually push a person onto the tracks to stop the train. This is because the tendency to do no harm is so great that that close connection between one's action and another's harm makes it that much more aversive. Therefore, pulling the lever to cause harm rather than directly pushing a person was much more favorable. Once again, this moral trait was seen cross-culturally. When the trolley problem was presented to people from the Malagasy tribe of Madagascar, they had different questions than American participants (who are the people involved, what is my relation to them) but regardless, answered in a very similar way to the American participants—choosing to sacrifice one person to save multiple people was the more favorable response, as it did the least amount of harm (Bloch, 2012).

Finally, cooperation is a common moral trait among humans. Human adults demonstrate cooperation through numerous examples in day-to-day life such as not cheating during card games, paying back someone who is owed money, or sitting quietly in a movie theater so as not to disturb other moviegoers. A classic example of human cooperation is seen through the

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prisoner's dilemma. The prisoner's dilemma is an interaction where two players can earn different payoffs based on cooperating or defecting (Fig. 1). Individuals receive the greatest reward by defecting, yet overall both benefit most by cooperating (Axelrod & Hamilton, 1981). Broken down, the reward for unilateral defection is greater than the reward for mutual cooperation, which is greater than the reward for mutual defection, which is in turn greater than the reward for unilateral cooperation (see Fig. 1). Participants are generally willing to cooperate, and more likely to cooperate when the game is being played in person than over a computer (Furlong & Opfer, 2009), demonstrating that personal interaction enhances likelihood to cooperate. A cross-cultural study on the prisoner's dilemma found that Chinese participants were likely to cooperate, but more likely to cooperate when they were primed with awareness of their Chinese culture—exposure to Chinese cultural images such as a Chinese dragon and a person performing kung fu (Wong & Hong, 2005). Generally the participants were likely to cooperate, but the fact that culture priming increased cooperation suggests that cooperation is a deeply important part of one's home culture.

		Subject's Choice	
		Cooperate (C)	Defect (D)
Partner's Choice	Cooperate (C)	\$3 (R)	\$5 (T)
	Defect (D)	\$0 (S)	\$1 (P)

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Figure 1: Matrix values in a typical prisoner's dilemma game. The most beneficial rewards for both parties come from mutual cooperation (R), although the most beneficial award for one party comes from defecting as the other party cooperates (T) (Furlong & Opfer, 2009).

These examples of universal behavior in human adults provide evidence that morality and moral behavior are traits that are common to virtually all human adults, much like traits such as capability of language or a preference for sweet and fatty foods. But where does morality come from? One common misconception is that morals come from religion; however, morality is not specific to religion, as secular organizations such as the United Nations and the American Humanist Association agree upon similar moral codes to each other and to religious organizations (Kinnier, Kernes & Dautheribes, 2000). If morals don't come from religion, do they come from others via other forms of social transmission? Or are they innate, built into our brains through evolution?

This question about the origins of morality—whether it arises from nature or nurture—has been debated as far back as the 15th century. Jean-Jacques Rousseau (1762) takes a strong stance for the nativist camp, arguing that: “everything is good as it comes from the hands of the Author of Nature; but everything degenerates in the hands of man” (pp. 1). The Rousseauvian view therefore, suggests that humans enter the world naturally good and then become corrupted by modern society. A strong stance for the empiricist camp, however, comes from Thomas Hobbes (1651) who argued that humans start life naturally ‘brutish’ but become saved from their natural state by society. The Hobbesian view, therefore, posited, that evil is innate, while morality comes from environment and culture. Though arguments on the origin of morality began centuries ago, current research has not progressed much further. In fact, evidence supports both sides of the argument—some work suggests that that morality is innate while other work suggests that morality is learned.

Current Research on Morality

Learned morality theory. One argument for effects of nurture comes from admittedly rare, vast cultural differences in moral norms. Cannibalism, for example, is horrendous and criminal to most, if not all, industrialized cultures but perfectly normal to headhunting cultures (Prinz, 2011). Less striking but nonetheless revealing evidence comes from cultural differences in victimless crimes -- Brazilian citizens take a more moralizing stance than Americans to an offensive yet victimless action such as defacing a national flag (Haidt, Koller & Dias, 1993). In addition, morality takes an individualistic stance with Americans whereas it takes a collectivistic stance among Hindu Indians (Miller, 1994). That is to say, Americans care more about personal morals and personal moral decisions whereas Hindu Indians care more about group morals and moral decisions that affected a group rather than an individual. In the study, Hindu Indian and American adults were presented with scenarios where, for a selfish reason, an agent failed to help another with a life-threatening issue, a moderately serious issue, or a minor issue. Hindu Indians were much more likely to say that not helping the other person was unacceptable, even if the issue was minor, whereas Americans were likely to view not helping as acceptable in all situations except the life-threatening one. With such differences existing between cultures, learned morality proponents believe that morals depend on an individual's upbringing, and therefore are not universal.

In addition to cultural differences, advocates of the nurture approach point to the lack of a biological basis for morality as support that morality is learned (Baron-Cohen, 2013). For a particular trait to be considered an evolutionarily endowed (innate) trait including variability between individuals, heritability from parent to offspring, differential reproduction, and selection (sexual, natural, or artificial). In the case of morality it's not clear that these criteria have been

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met. While there is some variability in moral intuitions and moral reasoning, if a trait is truly innate it should be heritable. However, researchers have yet to identify a genetic basis for moral reasoning (Hunter, 2010). For example, morally-objectionable behaviors cannot be linked to genetics in the absence of confounding environmental factors (Pollack, 2006). Since no 'morality genes' have been discovered some are convinced that morality cannot be innate. Morality also has selection pressure, as people with morals are more likely to reproduce and be mentally sound, and cause differences in reproduction, as it is more common for someone to have morals rather than not (Sperber & Baumard, 2012). However, the big problem is heritability. Since there is seemingly no genetic basis for morality, it cannot be inherited and, by criteria, cannot be a trait of natural selection, and therefore not innate (Ridley, n.d.).

Innate morality theory. Despite evidence that morals vary some across cultures and the lack of heritability of moral values, the evidence that morality is innate outweighs the evidence for the learned morality theory. Cultural differences may occur in morality, but people of all cultures still have some kind of morals. Cultures may differ in what exactly they think is right and what is wrong, but they still all have a sense that some behaviors are right while others are wrong. It does not matter if the specific content of these moral behaviors differ; the importance of moral values cross-culturally provides evidence that the capacity for morality itself is innate. Further, recent evidence hints that we may soon find some genetic basis of morality: subjects with a shorter serotonin transporter genotype allele were more likely to rate actions that caused intentional harm to another as acceptable while those with a longer allele were more likely to rate these actions as unacceptable (Marsh et al, 2011). Therefore, this suggests that the genetic argument for learned morality may no longer be plausible as further genetic research progresses.

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The innate morality theory states that morality is not a product of our environment, but innately hardwired in our brains. Proponents of this theory generally provide support for this theory by exploring moral reasoning in subjects with little ability to learn morality from humans—preverbal infants and non-human animals. The logic of studying these two populations rests on the assumption that if moral behavior is found in subjects with little to no human influence on their behavior, then it is highly unlikely that their morals were learned from experience, from culture, or from some other form of social learning. Human infants have had limited experiences, thus any sense of morality seen in infants is unlikely to have arisen from learning. Similarly, animals, even those that live with humans, are not acculturated the same way humans are, and thus if they demonstrate a sense of morality it will provide converging evidence that morality is innate.

Innate morality in preverbal infants. Preverbal infants have not yet had much opportunity to be shaped by society, which makes them a viable candidate for the innate morality theory. The field of infant morality is fairly new, yet several studies have already found moral behaviors in infants with relatively little experience. For example, 5 and 9-month-old infants who observed a puppet show with a moral (a puppet who helps another puppet achieve a goal of opening a box to retrieve a toy) and an immoral (a puppet who prevents another puppet from opening the box) opted to interact with the moral actor significantly more than the immoral actor (Hamlin & Wynn, 2011). Interestingly this preference did not appear to arise simply from a preference for a puppet that helps to meet goals generally, as this preference existed only when the actors were animate, apparently social, beings. When the ‘actor’ became an inanimate green pincer infants no longer preferred the actor treating the pincer ‘morally’ over the actor treating the pincer ‘immorally’. This work suggests that infants did not choose based on reinforcement

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history, or which puppet offered rewards (by opening the box for the actor), but that rather their choice was based on the social interactions they witnessed.

Additional evidence that infants have access to some moral intuitions comes from even younger infants. When 3-5 month old infants watched a puppet show where animate shapes either help another shape reach its goal (climbing a hill) or hindering the shape from doing so, they preferred the helper shapes significantly more than the hinderers (Hamlin, Wynn & Bloom, 2007). In general it appears that infants judge others based on the morality of their actions by preferring those who help helpers and those who harm hinderers (Hamlin, 2013).

Choosing a puppet or shape that does 'right' over one that does 'wrong' strongly suggests the infants used moral evaluation. These studies provide compelling evidence that preverbal infants make morally based decisions before language, before they have experienced these conditions themselves, before they could have been reinforced or punished for acting morally or immorally. In short, before cultural norms are likely to have shaped their moral intuitions.

In addition to demonstrating some sense of 'right' and 'wrong', infants share the aforementioned moral traits of inequity aversion, the tendency to do no harm, and cooperation with human adults. Since humans that are shaped by society (adults) and humans that are not (infants) both share these traits, it is likely that moral behavior is innate.

Inequity aversion can be observed in infants as young as 15-months old (Schmidt & Sommerville, 2011). Infants were shown a movie where a character distributed four crackers amongst two people. The exact distribution of crackers was blocked by a censor bar until it was removed to reveal one of two scenarios: the crackers were evenly distributed (two for each person), or the crackers were unequally distributed (one person had one cracker whereas the

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other had three). Infants looked longer at unfair distribution as opposed to fair, a common measure that infants' expectations about the distribution of crackers had been violated. In other words, infants expected an equal distribution and appeared 'surprised' by the unequal distribution. The infants had naturally assumed the distribution would be fair, so the unfair distribution was unexpected (Schmidt & Sommerville, 2011).

Although the tendency to do no harm may not be fully developed at such a young age, toddlers are still able to exhibit the tendency and the tendency to provide reparative behaviors when accidentally causing harm. Toddlers were very responsive to their mother's distress and even slightly responsive to a stranger's distress (Zahn-Waxler et al, 1992). Mothers simulated emotions or issues such as sadness, unresponsiveness and respiratory distress in front of their toddlers. The toddlers' responses were recorded by the mother initially. After one month, mothers returned to the lab and an experimenter recorded the toddler's response. One month after this, the child and mother went back into the lab and a female experimenter displayed the distressful actions. The study found that generally, the toddlers responded with physical or verbal prosocial behavior or empathic concern. The study also found that most toddlers exhibited reparative behavior when they themselves caused the stress as opposed to being a bystander witnessing the situation, and their reparative behaviors in general increased with age.

Finally, just like adults, infants generally cooperate with others. 14-month-old infants were presented with an apparatus that required one to push the bottom of a cylinder up and another to reach an opening on the apparatus to retrieve a reward. It was impossible for the infants to achieve this on their own, and both steps were necessary to gain the reward. After a single demonstration, most children were able to figure out how the apparatus worked and collaborated with an experimenter to achieve the goal (Warneken & Tomasello, 2007). Since the

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infants completing this task were only 14 months old, it provides evidence that the tendency to cooperate with others is a task that isn't learned from experience, but one that is likely innate.

Innate morality in non-human animals. Infants are capable of moral behaviors despite comparatively little adult human interaction, thus, it should come as no surprise that non-human animals are capable of moral behaviors as well. Since most non-human animals have little to no social contact with humans the existence of moral behavior in this population supports innate morality theory. For example, when rats were faced with two locked chambers, one containing food and the other containing a trapped fellow rat, the rats often freed the fellow rat before unlocking the food chamber (Bartal, Decety & Mason, 2011). The rats were not encouraged to, or rewarded for freeing the fellow rat—in fact, freeing the rat meant there was immediate competition for the food—yet rats freed their peer anyway. This study strongly casts doubt on the suggestion that morality arises from learning, as rats did this in the absence of training and at a cost to themselves. Their choice to free the other rat first suggests they preferred to help another rather than help themselves—a moral behavior.

Additional evidence that animals have a sense of right and wrong comes from rhesus monkeys who refuse food when it caused another monkey to receive a shock, African elephants who chase off attackers of a wounded elephant, and Capuchin monkeys who give large rewards to fellow Capuchins even if it means that they get a small reward (Lakshminarayanan & Santos, 2008; Poole, 1998; Wechlin et al., 1964). These examples of prosocial behavior without reinforcement in non-human animals add compelling evidence to the study of morality. If these animals engage in behaviors solely to help others, it is highly likely that they have developed a system of rights and wrongs. More compelling evidence comes from the fact that non-human animals share the same moral traits as human infants and human adults—inequity aversion, the

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tendency to do no harm, and cooperation. The existence of these traits in all three groups strongly suggest morality is not something that is fully shaped by the environment.

Perhaps the best evidence for inequity aversion comes from brown capuchin monkeys who responded negatively when given a lesser treat than another monkey for doing the same task (Brosnan & DeWaal, 2003). Monkeys were trained to hand an experimenter a token for a reward. When one monkey handed the experimenter a token it received a cucumber, a decent reward for monkeys. When an adjacent monkey handed the experimenter an identical token, it received a grape, which is a very favorable reward for monkeys. After witnessing this, the initial monkey handed the experimenter another identical token, presumably expecting to receive a grape. Instead, the monkey again received a cucumber. Monkeys who receive an inequitable distribution reacted aggressively when they were given a less-than-favorable reward than another for performing the same action. In a similar vein, domestic dogs stopped performing a command for a reward when another dog was given a better reward for the same command (Range et al, 2009). These displays after an unequal distribution of goods demonstrate that the monkeys and domestic dogs were aware of the inequity and possessed inequity aversion, much like human adults or infants faced with inequalities.

Just as animals show human-like tendencies for inequity aversion the tendency to do no harm can also be seen. Rats were trained to press a lever for food and once they learned this researchers introduced a new manipulation—after they pressed the lever, a rat in an adjoining cage was shocked (Church 1959). The lever-pressing rat witnessed the shock but still received food. After witnessing another rat harmed from their lever pressing a number of times rat refrained from pressing the lever, even if it meant they would not receive food. The decision to stop receiving a reward when it came at the cost of a fellow rat demonstrates that, generally, rats

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seek to not do harm to others. Importantly this exists even at the expense of reinforcement history – the rats were reinforced for pressing the lever with food, not for helping the other rat. Thus, this provides additional evidence against learning theory and suggests that even rats have moral intuitions against harming others.

Finally, animals demonstrate cooperation in a variety of situations. The classic task of cooperation involves working together to achieve an out of reach food source. Elephants were presented with an apparatus where they had to pull a rope to receive food (Plotnik et al, 2010). However, the ropes were looped around the food such that if one elephant pulled the rope would unravel from the apparatus and not bring the food to the elephant. The ropes would only retrieve the food when two elephants each picked up different sites of the rope and simultaneously pulled. When the elephants discovered this, they exhibited cooperative behavior by waiting for another elephant to come up to the apparatus before pulling the rope. The elephants even began to wait for their partner to pull the rope by waiting at the gate of their partner's enclosure before approaching the mechanism. In a similar experiment, chimpanzees were given an apparatus and tools to work the apparatus in order to receive a reward. The chimps needed to move a thin stick and a thick stick in order to tilt a platform and move grapes to a reachable location. The two tasks could not be performed at the same time by the same chimpanzee. The chimps exchanged tools and were able to use the correct tools the correct ways the majority of the time due to their good use of cooperation.

The fact that human infants and nonhuman animals demonstrate the same kinds of moral behaviors as human adults without same cultural trappings provides strong evidence for the innateness theory of moral reasoning. However, this viewpoint can only be supported if continued evidence of multiple species demonstrating moral behavior arises. Therefore, species

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that may have the capability for moral behavior should be studied to see if they too can support the theory of animal morality. One species that has not been extensively tested for moral behavior is the domestic dog (*Canis lupus familiaris*). Dogs co-evolved with humans over thousands of years, and since they are so closely related with human interaction, it is possible that they have adapted human intuitions into their behavior. A non-human species with close connections to humans is worth researching for evidence of moral intuition, as they offer up the animal and human sides of interaction and social behavior.

Moral Behavior in Domestic Dogs

Dogs are incredibly social creatures and show strong inter-species social cognition with humans. They exhibit many human-like behaviors and cognitions such as inferring intentions and solving means-end tasks (Hare & Tomasello, 2005, Range, Hentrup & Viranyi, 2011; Stauch, AuBuchon & Furlong, in prep). Additionally, dogs perform exceptionally at cooperation and communication tasks with humans and are able to perceive a human's actions as goal-oriented (Wobber & Hare, 2009, Marshall-Pescini, Ceretta & Prato-Previde, 2014). Dogs can even communicate well enough with humans to recognize human emotions of disgust and joy (Turcsan et al., 2014). Thus, dogs are very socially adept creatures. Domestic dogs even perform better than chimpanzees, our closest extant relatives, in a task involving use of social cues such as reaching, pointing and gazing. Further, domestic dogs also performed better than human-reared wolves at this task, even if the dogs were only a few weeks old (Hare et al., 2002).

Since morality is a social trait that is universal in humans, and dogs share many human social traits, it is extremely likely that dogs have evolved moral cognition due to centuries of human interaction. This is not to say that moral behavior was taught to the dogs by human observation, but that domestic dogs evolved moral behaviors over time, perhaps due to humans

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artificially selecting dogs exhibiting such traits. Much like any species uses adaptation to survive, dogs with a sense of morals may have been more likely to survive and reproduce than those that did not have a sense of morality.

We hypothesize that domestic dogs have a sense of morality, which can be demonstrated through their choices of social partners. To test if dogs made morally-based decisions, dogs were shown a puppet show similar to Hamlin and Wynn's (2011) puppet show. In this study dogs were shown a moral actor (who helped a neutral actor complete a goal) and immoral actor (who hindered the neutral actor from completing the goal), and their preference for the actors was recorded. We predict that the dogs, like human infants, will prefer a moral actor more, and thus will prefer to watch the neutral puppet interact with the moral actor to the neutral puppet interacting with the immoral actor.

Methods

Subjects

Volunteers were solicited in two ways: by flyers or conversation at Paradise Pets daycare in Bloomington, IL and by recruitment emails sent to Illinois Wesleyan University faculty and staff. Interested owners completed an online questionnaire about their dog including the dog's age, breed, health history, training history and temperament. Once this was received owners were emailed with additional information about the studies that take place in the lab. Dogs who were tested at Paradise Pets daycare were sent an informed consent form to sign and return while those who were tested on campus were sent scheduling information and were asked to sign the consent form upon their first visit to the lab. Only dogs whose owners both completed the online registration and signed the consent form were allowed to participate in the study. Subjects were

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27 domestic dogs of multiple breeds, both male ($n = 19$) and female ($n = 8$). They ranged in age from 5 months to 11 years ($M = 4.98$, $SD = 2.71$).

Materials

The stage for the puppet show was created out of PVC pipe and black fabric acting as a curtain and backdrop. The pipe stage's dimensions measured 49" x 26" x 27", with the curtains measuring in at 49" x 26". Behind the curtain but in front of the backdrop was a cardboard box covered in chrome tape and measuring 9" x 18" x 9 ½ "which acted as a stage. Three puppets (7 ½ " x 4 ½ ") were used in the show—a tiger, giraffe and cow puppet. The tiger was dark orange with black tiger stripes, the giraffe was yellow with brown giraffe spots and horns, and the cow was white with black spots and horns. All puppets had black eyes, a nose and a stitched-on mouth in the shape of a smile. Also used in the show were a translucent pencil box (2 ½ " x 8 ½ " x 5 ½ ") and a small (3" x 1") rawhide bone. The puppets were operated by hand until the test trial, where the moral and immoral puppets were placed on plastic water bottles (5 ½ " x 2 ½ x) that were taped to the stage to keep them standing up while the experimenter operated the neutral puppet.

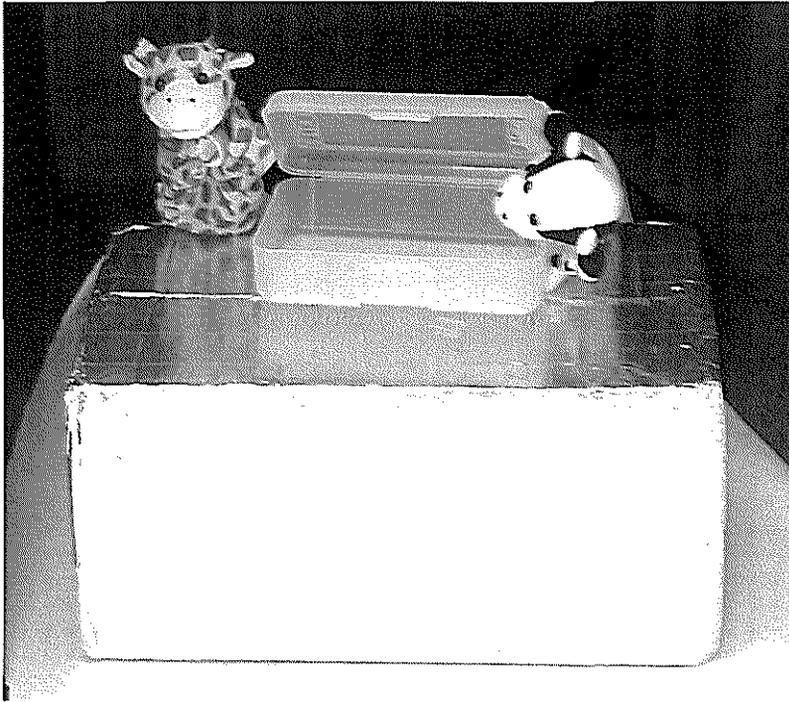


Figure 2: The puppet stage and actors at the end of the moral familiarization trial.

Preference Tests

A preference test was conducted to select puppets before the study began. Three puppets who were generally equally liked by the dogs (based on looking time) were used as the moral actor, immoral actor, and actor puppet interchangeably. The dogs' preferences were decided based on their time looking and interacting with each individual puppet when presented with multiple. Three puppets that the dogs interacted with/looked with about an equal amount of time (tiger, giraffe and cow) were chosen. The toy in the actor puppet's box, a rawhide bone, was also subject to a preference test so that the toy chosen was one that the dogs found mildly interesting—not exciting enough to be distracting, but exciting enough to attract their attention.

Procedures

Dogs were tested at an on-site laboratory at Illinois Wesleyan University or at a testing room at Paradise Pets dog daycare. Dogs entered the testing area and were given time to

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acclimate to the setting and greet the researchers before the study began. The study began with the dog being held by a handler (E1) blind to the conditions who looked away from the stage during testing and/or closed his/her eyes during the study. A second experimenter (E2) showed the dog a small rawhide bone and then put the bone in a box sitting on top of the chrome stage. A third experimenter (E3) was concealed behind the curtain and conducted the puppet show.

During the puppet show dogs witnessed a neutral puppet (NP) trying, with difficulty, to open a box to retrieve the bone inside. A rawhide bone was chosen as the box contents to pique the dog's interest, as it was not too interesting or too uninteresting to the dogs. Moral agent puppet (MP) then came onstage and helped NP open the box by pulling at the opposite end. After the box opened, MP left the stage and NP grabbed the rawhide bone inside. This scene was held static for a 10 second looking period during which E2 filmed the dog's looking behaviors

Next, the dogs witnessed the same scene—NP attempting to open the box—but an immoral puppet (IP) came onstage and jumped on the box, shutting it. After the box was shut, NP lay face-down on the ground to demonstrate frustration or distress and IP left the stage. Another 10-second looking period then elapsed.

All dogs received both of these events in counterbalanced order and with puppets randomly assigned to the three different roles. Until this point all dogs received the same treatment. The final test condition occurred when all three actors came onto the stage, with NP in the middle between IP and MP. NP looked at both puppets, and then moved to stand next to either the MP or IP to demonstrate its 'choice' of social partner. This choice was decided when an RA, blind to the conditions and the stage, called out either "1" or "2", dictating which condition the puppeteer would have for the test, 1 being the first familiarization and 2 being the second. NP remained with its choice of social partner for another 10 second looking period.

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If the dog looked longer when NP chose the MP, it was inferred that the dog preferred the MP to IP, as dogs tend to look at things they find interesting or attractive. The following were counterbalanced across subjects in each condition: experimental condition (social or inanimate), identities of actors (giraffe, tiger or cow puppet), order of shows (moral or immoral going first or second), and placement of actors (left or right) during choice.

Coding and Reliability

Primary video coding was done by the author, and two research assistants coded the same videos to measure inter-rater reliability. One coder was briefly and vaguely trained by the author, as they had no previous experience in coding a looking time study. The other coder had some experience but received the same tutorial. They were taught how to decipher if a dog was looking at the stage or not, and trained with a video not used in the study. All three coders coded the videos separately. Inter-rater reliability was .81 with the new coder and .95 with the experienced coder.

Differences from Original Study

The domestic dog replication study was much like the original with a few changes. In the original study with infants, the infant's preference was decided by recording which puppet they initially reached for in a testing period after familiarization with the actors—the moral or the immoral one (Hamlin & Wynn, 2011). In this replication, the dog's choice is decided by recording their looking time solely, not reaching, at test period after two familiarizations—one with the moral actor and one with the immoral actor. In addition, if the infant was not paying attention to the puppet show, they were excluded from the study. If a dog was not paying attention to the show, a squeaky toy was squeaked or their name was called so they could direct

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their attention back to the stage. However, if the dog continued to not pay attention, they were also excluded from the study. Finally, the present study did not have an inanimate condition, only a social one, in the interest of time.

Results

A 3 X 2 repeated measures ANOVA with trial type (moral familiarization, immoral familiarization, test trial) as the within subjects variable and condition (moral vs immoral outcome) as the between subjects variable revealed no interaction between trial type and condition ($F[2, 24]=.847^b$, $p=.441$), and no main effect of trial type ($F[2,24]=2.12^b$, $p=.142$). However, there was a main effect of condition such that dogs in the moral condition ($M=5.54$, $SD=.64$) looked longer than dogs in the immoral ($M=3.58$, $SD=.72$) condition ($F[1,25]=4.12$, $p=.053$).

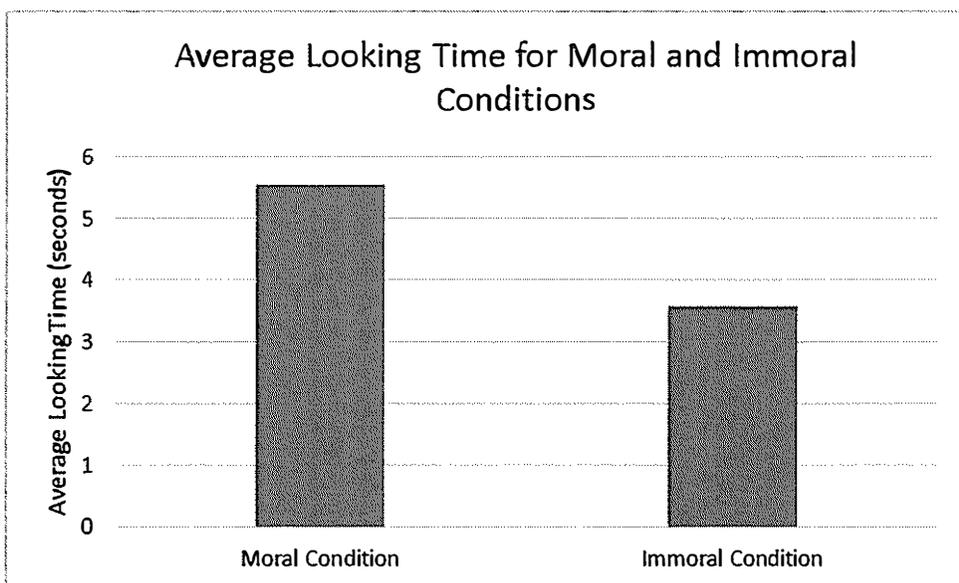


Figure 3: Results of 3 x 2 repeated measures ANOVA, measuring mean looking time at the immoral and moral conditions (moral fam. and moral test, immoral fam. and immoral test), with the latter being significantly higher ($F[1,25]=4.12$, $p=.053$).

To explore whether this effect was due to the crucial test condition and not the less important familiarizations (which should have been the same across trials as they occurred

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before the crucial test condition) we subtracted the average amount of time dogs looked in the familiarization trials from the amount of time dogs looked at the test. Typically, looking time decreases over time, thus we would expect this to be a negative number. However, we expect condition differences in the magnitude of this value such that dogs in the immoral condition will decrease their looking more than dogs in the moral condition. In other words, dogs in the moral condition should have a difference score closer to 0 than dogs in the immoral condition.

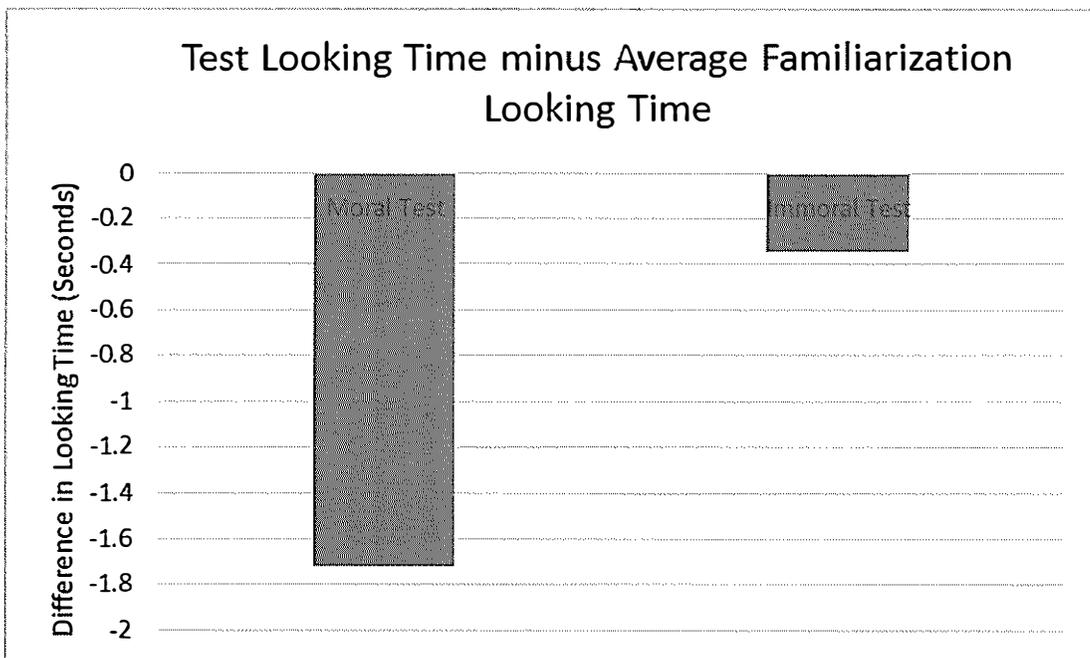


Figure 4: Results from subtracting the average amount of time dogs looked in the familiarization trials from the amount of time dogs looked at the test trial. Dogs looked less at the moral test than the moral familiarization, but looked at the immoral test and familiarization about the same amount of time.

A one-way ANOVA comparing this difference score in the two conditions revealed no significant difference in condition ($F[1,25]=1.74, p=.199$). Contrary to our predictions subjects in the moral condition generally looked less at the test than the familiarization ($M=-1.715, SD=2.9$), whereas in the immoral condition, subjects looked only slightly less at the test than the familiarization ($M=-.34, SD=2.37$). Although this difference was not statistically significant, this

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pattern is interesting since it is essentially opposite the overall means for the test trials in which overall dogs looked longer in the moral case ($M=4.98$) than the immoral case ($M=3.43$). This result appears to have arisen from dogs looking longer on average in the familiarization trials for the moral actor ($M=5.539$, $SD=.64$) compared to the immoral actor ($M=3.58$, $SD=.72$). Given that the dogs looked longer at the moral than the immoral actor in the familiarization tasks, however, the difference in the immoral condition should be greater than the difference in the moral condition, which is the opposite of the actual effect.

Discussion

To further explore the foundations of moral behavior, domestic dogs were tested for moral intuitions. Domestic dogs have superior social cognition to nonhuman primates and other species and a long history of co-evolution with humans. Thus dogs would be expected to be a good candidate species to find human-like moral intuitions in a nonhuman animal. We hoped to find that domestic dogs would look longer when a moral actor was chosen as a social partner by a neutral actor than if an immoral actor was chosen by a neutral actor. This result would be consistent with the literature of moral reasoning in human infants and would demonstrate that the dogs were able to make judgments about the moral and immoral actors based on limited information gleaned from familiarization trials. Further, it would demonstrate that and that dogs preferred the moral actors being chosen by the neutral actor, as that would be a logical and accepted choice.

What our results portrayed, however, was that dogs looked longer at the familiarization trials as opposed to test trials when the choice outcome was to an immoral actor. This result is surprising given that dogs are not assigned to conditions – moral or immoral – until after these familiarization trials have been completed. Further, assignment is blind– one researcher calls out

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a number (1 or 2) which the puppeteer then uses to assign the condition. Importantly, the person who calls the condition does not know which outcome 1 and 2 are, and the person who is putting on the puppet show cannot cue the dog one way or the other as she is concealed behind a screen. Thus, we must conclude that due to random factors we found dogs who were, on average, more likely to look longer in the moral condition than the immoral condition.

These unexpected results produce more questions for further study than answers.

Generally, it is difficult to make a definite conclusion on whether dogs preferred the moral or immoral actor, as the results were contradictory. The difference in looking time at the familiarizations support the theory that dogs prefer the moral actor ($M=5.42$, $SD=3.43$) to the immoral one ($M=4.64$, $SD=3.1$) but the lack of difference in test trial looking time and the change in familiarization to test looking time do not support the theory.

However, the results support that the dogs may differentiate between the moral and immoral actor. Therefore, the dogs are able to distinguish the two, but do so in a different way than the infants in the Hamlin and Wynn (2011) study. The infants reached for and looked at the puppet in the testing period that they preferred, but the dogs did not show a significant preference in the testing period, or even a significant preference in familiarization trials. However, since the combined looking time for moral familiarization and test was significantly higher than the combined looking time for the immoral familiarization and test, there is another way of differentiating at play for the dogs. Since the dogs' looking time in the familiarization and the testing period for the immoral condition were very similar, whereas looking time dropped for the moral condition, it may suggest that a violation of expectation paradigm may be at play. This means that the dogs would look longer at something that they find unexpected and surprising. The dogs may be looking about the same amount of time for the testing period due to

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the neutral puppet's choice of the immoral actor being illogical to them. Regardless, it can be concluded that the dogs differentiate between the two, but their processes for doing so are unknown.

The results garnered from the study could be interpreted as some mild support for the innate morality theory or the learned morality theory due to their contradictory nature. It could just be that the dogs in the experiment generally were longer lookers, and the differences between the two groups are not based on actual analysis of the actors and their behavior. Therefore, we could not say that morality was innate. If the dogs are incapable of preferring the moral actor to the immoral actor, it is unlikely that they are capable of moral intuition. This provides evidence for the learned morality theory, as morality must be something that humans learn through experience and environment, and animals are incapable of it.

However, due to the clear differentiations between the moral and immoral actors that the dogs demonstrated, it is difficult to say that the differences happened through coincidence. Although the results contradict themselves, one can still argue that the dogs are able to discern between the moral and immoral actors. The processes the dogs use to differentiate the two are yet to be determined, but this may be discovered with further research. The simple fact that there is a significant difference in the looking times provides evidence that moral intuition may be something that is innate in domestic dogs.

Limitations

A notable limitation on the study was the small sample size. Generally, in a subtle looking time study, the preferred sample size is between 40 and 50 participants per condition. Given the present study only reached 27 subjects total (12 in immoral condition, 15 in moral

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condition), we cannot say that our results are generalizable, as the sample was far too small. An increase in the number of subjects would most likely make the results more accurate and increase external validity. In addition, a larger sample size may provide clearer results. That is to say, the results garnered through the present study were contradictory, and a large sample size may clear up discrepancies.

Further Directions

Due to the significant results in comparison of looking time of moral vs. immoral condition, this subject of study is worth researching further. A replication of this study with a larger sample size would likely produce more insight on the subject and more accurate, generalizable results. A replication study could also extend the methods to include the inanimate condition as utilized in the original Hamlin & Wynn (2011) study to see if any significant differences arise between the social and inanimate condition. The subjects could also be tested as within subjects rather than between subjects. That is, dogs would participate in the moral condition and the immoral condition to test for a difference in looking time, whereas in the present study, dogs were either in the moral condition or immoral condition. With dogs participating in both, a better conclusion could be reached to make sure individual differences in the length of looking time did not inhibit the results. For example, dogs may be general long lookers or short lookers. Without a dog's looking time at the opposite condition, we cannot be sure that our results are real. A long looker may look at the immoral test for 5 seconds, and a short looker may look at the moral test for 2 seconds. By testing for both conditions, finding out that the long looker looked at the moral test for 10 seconds and the short looker looked at the immoral test for a few milliseconds would provide better information about the dogs' general attitudes and ensure that individual differences did not skew results. In addition to this, the study

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could be broken down by subject to see if there are differences in looking time between the sex of dogs, the age of dogs (old versus young) or even the occupation of dogs, as a couple of subjects in the study were therapy or working dogs.

The aim of this study was to decipher if domestic dogs were capable of having moral intuition by measuring their looking time at a moral and immoral actor in a puppet show. Unfortunately, the results do not provide us with a clear answer to the question. However, the results do suggest that domestic dogs are capable of discerning between moral and immoral actors in some way. With further research on this issue, whether it is a replication of this study or different studies to test dogs for moral intuition, further evidence for animal morality may be produced. Although this study did not provide a clear answer one way or the other, the evidence of discernment creates opportunities for further research to answer these questions.

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