Relationship effects in psychological explanations of nonhuman behavior

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Abstract

Research suggests that close relationships with animals encourage psychological explanations of their behavior. To determine the causal effect of ownership on psychological explanations, we conducted experiments in which we manipulated participants' ownership of a target imagined dog (experiment 1), animated object (experiment 2), and real pet fish (experiment 3). Adapting scales used in previous research, we obtained ratings of how intentional the target's behavior was, the target's reasons (rather than causes), and references to complex human-like emotions, motives or characteristics. In experiment 1, 26 volunteers and staff at an animal shelter imagined scenarios involving their dog, a neighbor's dog, their friend, or a visitor. Participants' intentionality ratings and the target's reasons were similar for a friend, a visitor, and their dog. In experiment 2, 36 participants watched a film of three moving objects. Half of the participants were told the small triangle was theirs. In the ownership condition, participants vilified the "aggressive" big triangle more, gave more causal history for reasons, and gave more social, humanlike narratives. In experiment 3, 82 university students and staff were given a Betta fish either to own or to care for temporarily, and they were to report daily or weekly on the fish's behavior. Ownership and reporting frequency did not directly influence outcomes. Rather, ownership predicted commitment to, and affection for, the fish. Affection, in turn, significantly predicted participants' psychological explanations including how smart the fish was, how much the fish liked the participant, how similar the fish was to the participant, and psychological explanations of social behavior such as turning toward a visitor. Automated analyses of participants' language showed that affection also predicted their use of social psychological and emotion words to describe the fish. We discuss alternative processes whereby social relationships give rise to psychological explanations of behavior.

Keywords: *anthropomorphism, attachment, attributions, ownership, psychological explanations, relationships*

Those of us who own pets sometimes explain their behavior in the language of human psychology. Recently, a dog trainer posted on the web, "People think their dogs are spiteful sometimes...People think their dogs have separation issues and need play dates" (Katz 2005; also Klein 2005). The phenomenon is not uncommon. People in all cultures have a predilection for psychological description of

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animal behavior. Scientists since Francis Bacon, five centuries ago (Guthrie 1993, p. 62; see also Povinelli and Preuss 1995) have decried this behavior as an undesirable form of anthropomorphism or folk psychology. More recently, scholars have argued that anthropomorphism is an overly general label for justified, as well as unjustified, attributions and assumptions about nonhumans (Fisher 1991; Bavidge and Ground 1994). Further, what is considered anthropomorphic varies across cultures and time, and the orientation and language of scientific fields (Crist 1999). Researchers thus have become more interested in the bases of psychological description.

The purpose of the present article is to show how people's social relationship with an animal or object influences their likelihood of giving psychological explanations of its behavior. By psychological explanations we mean descriptions of the causes of behavior in terms of social motives and goals, secondary emotions (e.g., admiration), and reasons, for example, "He did X because he wanted to get even." This is an important question because our use of psychological explanation has implications for many other attitudes: how we differentiate humans from other beings, how we think about animal welfare, and our interactions with animals (e.g., Fidler, Light and Costall 1996; Rajecki et al. 1999; Serpell 2002), artifacts (e.g., Parise et al. 1999) and other people (e.g., Leyens et al. 2000). For instance, Leyens et al. (2000) showed that people attribute more complex secondary emotions to members of their own ingroup, and they argue that denying secondary emotions to others indicates a rejection of their humanity.

Cognitive-Perceptual Bases of Psychological Explanations

The literature in cognitive science (and more recently neuroscience [Blakemore et al. 2001]) suggests that psychological descriptions of behavior arise as cognitive constructions of involuntary, automatic perceptions. People universally perceive causality and animism in animals and objects that move and change their trajectories nonlinearly, especially when they seem to interact with their environment as by avoiding obstacles or seeking goals (for reviews, see Blythe, Miller and Todd 1999; Scholl and Tremoulet 2000).

One of the earliest investigations bearing on psychological explanations of behavior was a study by Heider and Simmel (1944) in which they created a film showing three animated objects apparently interacting (download available at http://anthropomorphism.org/psychology2.html). Heider and Simmel reported that participants perceived a meaningful structure in the movement of the objects. Participants perceived the objects to be causing one another's behavior, to have goals, and to exhibit avoidance of obstacles and escape from threat. Further, most viewers created elaborate social narratives to describe the film, in which they attributed human purposes, emotions, personality traits, and abilities to the objects. This latter phenomenon has been replicated repeatedly (e.g., Berry et al. 1992) and has been recorded in experiments with groups of animated objects (Bloom and Veres 1999). Running the Heider-Simmel film backwards, or more slowly or quickly, can destroy its perceived meaningfulness and associated social narratives. Thus, the interpretation of such visual events as causal or non-causal depends initially on precise psychophysical events that combine time- and/or space-contiguity between events with relative velocities (Schlottmann and Shanks 1992; Schlottmann and Surian 1999).

It is not entirely clear why people create social narratives to explain events they perceive to be causally related or living (or lifelike), but this tendency seems closely

related to changes in the inferential principles they are using, for example, attending to motives or relationships. If so, animations that look causally related and lifelike, such as those in the Heider-Simmel film, might activate mental linkages to related situations in a process called "structure mapping" (Gentner and Markman 1997). For example, when the big triangle seems to cause the circle and small triangle to move away at a rapid pace, this event activates thoughts of situations in which people escape threat. These cognitive constructions, consciously or unconsciously, help people impose structure and order on their observations, especially when the target's true nature is unknown (as is the case with animated objects and with animals). Similar processes occur when we judge people's interactions with one another (Srull and Wyer 1979; Gilovich 1991; Bargh, Chen and Burrows 1996).

Social Factors in Psychological Explanation

The perceptual and cognitive processes described above do not explain several anomalies in people's accounts of animals. People explain their pet animals psychologically more than other animals (Herzog and Galvin 1997). They make excuses for their own pet's poor behavior more than others' pets (Rajecki et al. 1999). Owners accord their pets advanced human capabilities and emotions but not necessarily other people's pets (Shapiro 1990; Sanders 1993; Fidler, Light and Costall 1996, Bahlig-Pieren and Turner 1999). This tendency may be part of the more general tendency to accord value to the things we own. Caporael and Heyes (1997) argued that one reason people explain animal behavior psychologically is to engage socially with them. By adopting psychological explanations of behavior, people give value to organism–environment interactions, and limit the degrees of freedom for potential interactions. Psychological explanation " is a way of changing the values we place on [animals] and how we can behave towards [animals] (p. 70)." If psychological explanations are partly a value prescription process that facilitates potential interaction, then close positive relationships with particular animals or objects should encourage psychological explanations of behavior. In particular, owning an animal typically requires its owner to engage the animal socially. Ownership implies these interactions have value. Interactions can lead to psychological closeness, as well. Thus, owning a dog should instigate high levels of psychological explanation.

In the studies below, we defined psychological explanation of behavior as the attribution of behavior as intentional, as having reasons, and as involving complex emotions (e.g., guilt) or thoughts (e.g., retribution). Following from the arguments above, we hypothesized that an ownership relationship with a nonhuman would increase psychological explanations. In the experiments, we manipulated the ownership relationship with the nonhuman so as to isolate its causal impact.

Experiment 1

Fidler, Light and Costall (1996) reported that students who had owned pets were more likely to use psychological explanations of a dog's behavior than those who had not. Pet owners and their families, however, may differ in many ways from non-owners, preventing us from inferring causality from the observed ownership–explanation link. We carried out a conceptual replication of the work by Fidler, Light and Costall (1996) by manipulating the participant's relationship with a rated target and the species of the rated target.

Methods

The design of this study was a two-factor 2 (Distant Relationship vs. Close Relationship) × 2 (Person vs. Dog) within-subjects factorial experiment.

Participants. Participants were 22 female and 4 male adults, mean age 45 years, who were volunteers and staff at a no-kill animal shelter. They completed the study in exchange for a $5.00-per-person contribution to the shelter. Nine did not themselves own a dog (seven of this group owned cats).

Procedure. All participants were given a booklet and, on each page, were asked to rate the intentionality and to write a brief explanation of one of six hypothetical behaviors. The six behaviors were: "met you at the doorstep when you entered your home;" "left a mess in your kitchen;" "when a fire alarm sounded at night, led you outside;" "yelped when the pot boiled over in your kitchen;" "woke you up in the early morning;" and "sat next to you when you were feeling sad." These six behaviors were attributed separately to two target dogs and two target persons. One dog was said to be "your dog," and the other dog was said to be "a neighbor's dog." One target person was said to be "your friend," and the other was said to be "a visitor." Participants made the 24 judgments sequentially, in random order. We predicted that participants would rate both persons' behavior as highly intentional, and that they would explain their behavior as having reasons. We also predicted that participants would rate the dog said to be "your dog" as more intentional than a neighbor's dog (Target X Relationship statistical interaction).

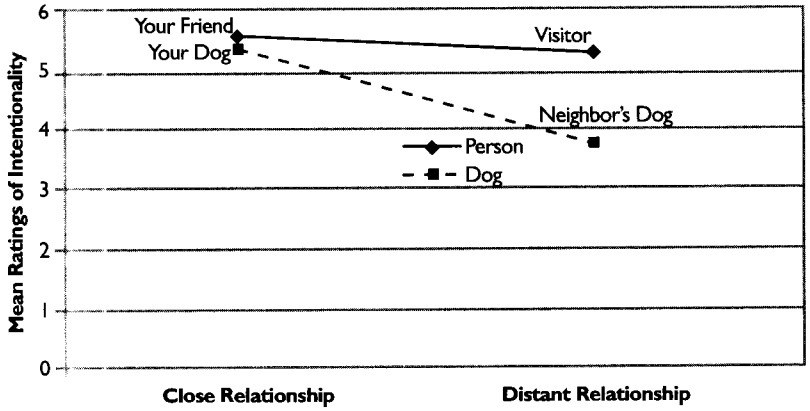
Measures. Following the theoretical work of Malle (1999) and a procedure for eliciting explanations of behavior (Malle 2000), participants rated the intentionality of each behavior on a 7-point scale, from unintentional to intentional, and then were asked an open-ended question: "Why did [your dog/the neighbor's dog/your friend/the visitor] [hypothetical behavior]?" The participants also answered questions about their demographic characteristics, their experience with animals, and they assessed their knowledge of people and of animals.

Coding. We adapted the F.EX (version 4) procedure developed by Malle (2000) for coding folk explanations of behavior as cause explanations, causal history for reasons, or reason explanations. For instance, a dog or person leading one out of a burning house could be explained as a fear response (cause), as a consequence of his love for you (causal history for reasons), or as his wanting to lead you away from danger (reason). We considered causal history for reasons and reason explanations to be more psychological than causes are. When participants gave two explanations, we coded only the first. The reliability of two raters blind to condition was $r = 0.70$, reduced in part because some explanations were too brief to be coded, for example, "alarm." Accordingly, we dropped one-word explanations and used a third trained coder who adjudicated when the two coders differed in their ratings.

Results

Intentionality Ratings. The analysis of intentionality used multi-level regression due to the within-participants design. The independent variables were target species (dog vs. person) and relationship (close [your dog/your friend] vs. distant [neighbor's dog/a visitor], and the interaction of these two factors). We controlled for subject (random variable) and whether or not the participant was a dog owner (fixed variable). We also examined the impact of the valence of the hypothetical behaviors.

Figure 1. Mean ratings of the intentionality of six behaviors performed by people and dogs as a function of the rater's relationship with the target (Experiment 1).



We report the effect size, Cohen's *d*, of statistically significant regression effects. The effect size measures the magnitude of an effect independent of sample size; roughly, an effect size of 0.8 or greater is considered "large," 0.5 is "medium," and 0.2 is "small."

In a model with the manipulated variables (target species and relationship, and their interaction), the valence of the hypothetical behavior (positive vs. negative), and the actual dog ownership status of the participant (a dog owner or not), we found, first, that more positive behaviors were rated as more intentional whether they were done by a dog or by a person ($F_{(1, 590)} = 75, p < 0.0001, d = 0.71$). (For instance, leading one out of a burning house was considered much more intentional than messing up the kitchen.) Also, participants gave significantly higher intentionality ratings to persons than to dogs ($F_{(1, 590)} = 31, p < 0.001, d = 0.45$), and higher ratings to targets with whom they had a close relationship rather than a distant one ($F_{(1, 590)} = 36, p < 0.001, d = 0.49$). Finally, as hypothesized, participants rated "your dog" as having greater intentionality than "a neighbor's dog" (interaction $F_{(1, 99)} = 6.8, p = 0.01, d = 0.53$). The means (and standard deviations) of the four conditions across all scenarios are as follows: friend = 5.6 (1.9), visitor = 5.3 (2.3), your dog = 5.4 (2.2), neighbor's dog = 3.8 (2.7). Thus, whereas the two persons (friend and visitor) were not rated differentially intentional (contrast $F = 1.3$, ns), the two dogs were differently intentional (contrast $F = 22.5, p < 0.001, d = 0.95$). Figure 1 shows the interaction effect.

Explanations. Participants' written explanations of dog behavior frequently used the language of human emotion and knowledge. For example, when told the pot boiled over, a participant said, "My dog knew something was wrong." Another said her dog sat with her because "my dog knows when I am feeling bad." Still another said, "she [the dog] wanted to cheer me up." As predicted, using the Malle coding approach, when the dog was "your dog" as compared with "a neighbor's dog," participants were more likely to give a reason explanation for the dog's behavior (41% vs. 30%) or a causal history of reasons (40% vs. 32.5%) and they were less likely to use a cause explanation (19.3% vs. 37.3%; $\chi^2 = 22.2, p = 0.01$). Explana-

tions of the behavior of the two persons, though overall more likely to be reasons than when the target was a dog (56% vs. 35.5% reason explanations), did not differ for the friend as compared with the neighbor.

We wondered if past experience with dogs, or knowledge of dogs or people, would predict intentionality ratings and explanations. Participants' actual dog ownership tended to predict higher intentionality ratings of dogs, but not significantly so. Staff who worked with dogs daily did not rate dog behavior as more or less intentional than volunteers did. Those with more self-rated knowledge of dog behavior gave marginally higher ratings of intentionality to dogs ($F_{(1, 283)} = 3.5$, $p = 0.07$, $d = 0.22$). Perhaps more striking, those who rated themselves as more knowledgeable about people gave dogs higher ratings of intentionality ($F_{(1, 283)} = 7.8$, $p < 0.01$, $d = 0.33$). Self-rated knowledge of either dogs or people did not predict the ratings of the intentionality of persons' behavior.

Discussion of Experiment 1

Our findings give support to the Caporeal-Heyes' argument that relationships with animals lead people to explain their behavior in human terms. Many of the participants used psychological explanations of human social behavior in explaining the behavior of a hypothetical dog, particularly when they had a hypothetical ownership relationship with the dog. The results of experiment 1 have limited generalizability due to the animal-oriented participant sample and hypothetical scenarios and target stimuli. Further, we can only speculate why the hypothetical ownership relationship led to more psychological explanations of behavior. Ownership has both interaction and emotional components. Participants might have used more psychological explanations with an owned dog to help them understand or articulate their imagined interactions with the dog. Or, they might have used more psychological explanations as a consequence of their assumed emotional attachment to the owned animal (Malle and Pearce 2001). We conducted experiments 2 and 3 as conceptual replications to help overcome these limitations. In both studies, we also measured participants' affection or liking for the target as a way to understand emotional aspects of psychological explanation.

Experiment 2

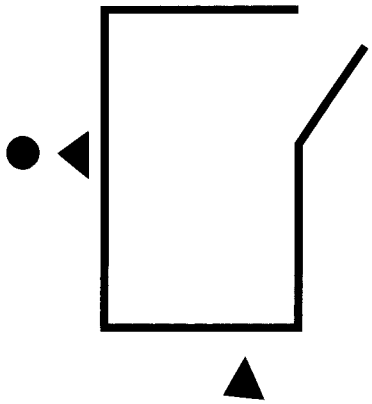
In this study, we examined how people's relationship with the small triangle in the Heider-Simmel film (described above) would influence their psychological explanations of the moving shapes. We hypothesized that those who were told the small triangle was theirs would use more psychological explanations of the behavior of the objects in the film.

Methods

The design was a one-factor (Experimental vs. Control) between-subjects experiment. In the experimental condition, we told randomly assigned participants that the small triangle in the Heider-Simmel film was theirs. We compared their explanations of the objects' behavior in the film with those of a control group that saw the film without any intervention.

Participants. Twenty-one male and 15 female Carnegie Mellon University undergraduate and graduate students, mean age 23 years, participated in the study.

Figure 2. Still image from chase scene in the Heider-Simmel video used in Experiment 2.



Half of the participants were assigned randomly to the Experimental condition and half to the Control condition.

Procedure. We digitized Heider and Simmel's (1944) animated film into a 72-second Flash video (anthropomorphism.org/psychology2.html) that we played on a computer display along with all the instructions and forms for the study. All participants read that they would watch a short video twice and answer questions about it. They were told they did not have to memorize the video but would "give us your ideas about what happens." Figure 2 shows a still image from the video.

Participants in the Experimental condition received the following additional instructions: "Before we start, we will have a drawing to determine which object in the movie is yours." The experimenter showed the participant a pile of envelopes and asked the participant to pick one. Inside all envelopes there was a small black triangle, with a white label, "the little triangle." The experimenter told these participants "Okay, this little triangle is yours" and put it next to the computer, within the visual field of the participant. At the start of the video, these participants were asked, "Which object is yours? Please click on your object to start the video." Pictures of the three shapes and their labels were attached. Participants in the Experimental condition clicked on the hyperlink labeled "the little triangle" and started the video. The Control participants did not see the above instructions, nor were they told that any shape was theirs; they moved directly from the general instructions to watch the video.

Measures. Immediately after seeing the Heider-Simmel video twice, participants described what they saw by typing into a response dialogue box. Then they answered four questions about the small triangle's behavior during the video: "Why did the little triangle stay with the circle?" "Why did the little triangle hit against the big triangle?" "Why did the little triangle move into the rectangle?" "Why did the little triangle leave with the circle?" For each question, participants were shown a snapshot of the relevant portion of the video. Participants rated the intentionality of the little triangle's movement as in the first experiment, the likeability of each of the objects, and how human-like the movement was of each object (where 1 = a rock and 10 = a real person). They also rated their knowledge of human behavior and answered questions about themselves.

Coding. We applied Malle's (2000) method for coding explanations of behavior, as in experiment 1. We also used the coding method of Berry et al. (1992), who studied people's "anthropomorphism" (human psychological language and explanations) of the Heider-Simmel film. For the latter procedure, we first unitized the

free descriptions into meaningful phrases. Then two raters blind to condition coded the subject of the phrase and the types of psychological responses describing the subject: action referents such as "hitting," state referents such as "frustrated," trait referents such as "dominant," social roles such as "allies," age referents such as "adult," and gender referents such as "she." We counted each of these, for each phrase and for each object. There was 85.5% agreement between the coders. Disagreements were resolved by a third coder. Following Berry et al. (1992), we also coded the themes in the descriptions: aggression (e.g., "aggressive"), escape (e.g., "ran away"), cooperation (e.g., "helpful"), failure (e.g., "failed to"), and effort (e.g., "tried to enter"). The agreement between the two coders was 93.9%. A third coder resolved all disagreements. Generally, using Berry et al.'s codes, women used more psychological explanations than men did, and non-US citizen Asian students less so, so we used these as control variables in analyses.

Results

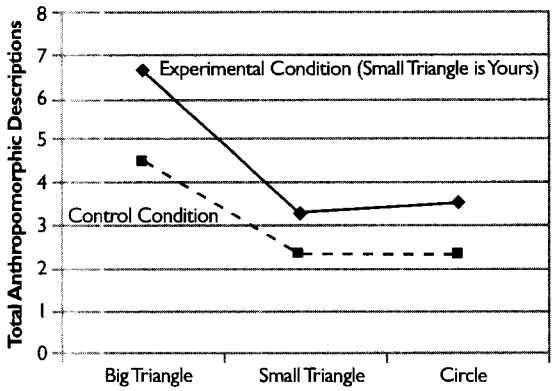
All but one participant (in the control group) employed social narratives of the objects in the video, typically writing a coherent story in which they characterized the circle as a compatriot (friend, lover, companion) of the little triangle, and the big triangle as an evil figure (bully, bad guy, aggressor). The analyses of all ratings and explanation data were conducted using a 2 × 3 repeated measures ANOVA, comparing the experimental and control conditions and using the different objects rated or explained as the repeated measure (that is, little triangle, circle, big triangle). The manipulation did not change participants' ratings of how human-like the shapes' movement was ($p > 0.1$), so we did not use this variable in further analyses.

Affection ratings. The experimental manipulation had a small effect on the pattern of participants' affection for the shapes in the video. Those in the Experimental condition ("your little triangle") rated the little triangle and the circle as slightly more likeable than did those in the Control condition (little triangle: mean = 8.2 [*SD* = 1.6] vs. 7.7 [1.8]; circle: 7 [1.9] vs. 6.1 [1.9]) and the big triangle as less likable (2.6 [1.4] vs. 3.6 [1.9]; repeated measures interaction $F_{(2, 30)} = 2.4$, $p = 0.10$, $d = 0.58$).

Intentionality ratings. The participants in both conditions rated the intentionality of the small triangle equally highly, and increasingly so over the four scenes we had them judge (from a mean of 7.7 out of 10 scale points in the first scene shown, to 9 out of 10 points, in the last scene). There was little variability, with almost all participants saying the behavior of the little triangle was very or extremely intentional.

Explanations. As noted above, participants gave coherent social narratives of the objects' movements (e.g., "I witnessed a fight between a group of objects."). Explanations of causality using the Malle coding scheme were more likely to be reasons for the behavior (mean = 2.9 [*SD* = 1.4]) than causal histories of reasons (1.7 [1.5]) or causes (0.7 [1.0]). Those in the Experimental condition as compared with the Control condition gave as many reasons (2.6 [1.5] vs. 3.1 [1.6]) and causes (0.76 [1.2] vs. 0.55 [0.86]) for the objects' behavior, but the Experimental group's reasons were more often accompanied by an explanation in terms of a causal history (2.1 [1.4] vs. 1.3 [1.5]); repeated measures interaction ($F_{(1, 33)} = 3$, $p = 0.09$, $d = 0.62$); causal history contrast ($F_{(1, 33)} = 4.6$, $p = 0.03$, $d = 0.77$). According to Malle (2000), causal histories explain the precipitating events and states that lead to intentional behavior. In this study, for example, a participant in the Experimental

Figure 3. "Anthropomorphic" words and phrases describing objects in the Heider-Simmel film, Experiment 2. (Coding from Berry et al. 1992).



condition wrote, "My triangle left with the circle because it was their chance to get away from the big triangle." Another wrote, "They loved each other."

Using the coding method of Berry et al., the descriptions written by those in the Experimental condition were more anthropomorphic as Berry et al. defined the term than were the descriptions by those in the Control condition ($F_{(1, 31)} = 4.3$, $p = 0.04$, $d = 0.77$; see Figure 3). That is, in the Experimental, as compared with the Control condition, the little triangle was more likely to be described explicitly as acting in a human manner, having human emotional states, having human traits, having human social roles (3.2 [2.0] vs. 2.3 [1.9], as was the circle (3.4 [2.4] vs. 2.3 [2.7]) and the big triangle (6.8 [3.1] vs. 4.6 [2.9]). Note that the big triangle was viewed as having the most humanlike characteristics, suggesting that extremes of behavior, or perhaps highly consistently good or bad actions, can lead to psychological explanations.

Those in the Experimental condition, as compared with the Control condition, also were more likely to use social themes of cooperation (2.0 [0.86] vs. 1.5 [0.76]; $F_{(1, 31)} = 9.7$, $p < 0.01$, $d = 1.2$) and escape (1.6 [0.5] vs. 1.0 [0]; $F_{(1, 31)} = 5.6$, $p = 0.02$, $d = 0.87$). For example, one participant said, "The little triangle wants to help the circle get away from the large triangle while also keeping the large triangle imprisoned in the rectangle for as long as possible." Having a perspective of the small triangle as "theirs" seems to have activated in some participants a highly social script, in which participants imagined a close relationship between the small triangle and circle, and constructed a story of battle between the couple and the aggressive, large triangle.

Discussion of Experiment 2

The participants in this study merely viewed a film of objects moving. Our results indicate that even in this comparatively sterile situation, participants' relationship with one of the objects influenced the way they interpreted the film. When the little triangle was "theirs," they tended to see the situation as more social, to feel closer to the little triangle and the circle, and more negatively about the big triangle. They also gave more psychological explanations of all the objects' behavior when the little triangle was "theirs." This study provides some support for our argument that a close relationship through ownership can lead to more psychological explanations of behavior.

Experiment 3

Experiment 1 examined a hypothetical relationship with a dog, and experiment 2 examined a relationship with an animated object. To increase the validity of and generality of our results, in this study we experimentally manipulated participants' ownership of a pet fish. We also examined the separate effects of ownership of the pet fish and the amount of required interaction and observation of the fish. In the world, ownership of a pet is highly correlated, not just with an owner's felt relationship with their pet, but also with the degree to which the owner observes the animal's behavior and responds at close range (daily in the case of most pet owners vs. occasionally in the case of most non-owners). The effects of ownership on psychological explanation might derive from this more frequent observation rather than from ownership per se. To examine the impact of ownership separately from the amount of observation, we manipulated these two variables orthogonally. We did not manipulate affection directly but we measured owners and non-owners' affection for the fish in order to evaluate the possible mediating effects of affection on psychological explanations of behavior.

Methods

The design of this study was a two-factor 2 (Fish Owner vs. Fish Caretaker) $\times$ 2 (Daily vs. Weekly Report) between-subjects factorial experiment.

Participants. Eighty-two staff and students at Carnegie Mellon University were recruited for a study in which participants would care for a Betta fish. Participants were told the study would last for two weeks, and that they would be paid $20.00 for completing the study.

Procedure. The investigators submitted the experimental protocol to the university's regulatory panel for protection of vertebrate animal subjects, and it was approved. Among the steps taken to protect the fish in the study were: (a) the vendor was chosen carefully for its specific plan and guarantee of low stress transport and protection of the fish; (b) a fish care center was set up in one of the authors' offices to provide appropriate air and water temperature, water preparation, and food for the fish; (c) the authors purchased one-gallon containers to house each fish; (d) the authors constructed specific routine procedures and forms for educating participants and monitoring and ensuring the health of the fish while participants were caring for them; (e) after the experiment was completed, the senior author cared for the pet fish while participants were away on holiday and arranged adoptions of remaining or unwanted fish.

When participants came to the experimental room for the study, they were given a choice of one of three fish to take home. All fish were male Betta in a range of colors. Participants were given a large fish bowl, conditioned water and conditioner, sufficient food for two weeks, a disposable camera, and detailed oral and written instructions on the care of the fish.

In the Owner condition, participants were told, "We are studying caretaking. . .we will let you choose a fish for you to own. You will take your fish home and report its activity to us...Then, after two weeks, you will bring your fish back for a check-up so that we can verify your fish is alive and well. We will also ask you to fill out a questionnaire..."

In the Caretaker condition, participants were given the same instructions except they were told the experimenter did not have enough fish for adoption yet so some fish were borrowed from prior participants. Participants were told, "...we will let you choose a fish to care for now. You will take this fish home and report its activity to us ...Then, after two weeks, you will bring this fish back...By that time, we will have another fish for you to adopt."

Cross-cutting the manipulation of ownership, we manipulated the participant's required amount of interaction and observation of the fish. In the Daily Report condition, the participants were asked to take a picture of their fish every day and send in an email report on the fish's behavior. In the Weekly Report condition, the instructions and email were the same, except that the observation and report was to be done only once weekly during the two-week period.

Once the participants had signed their agreement to the requirements of the study, they made an appointment to return with the fish two weeks later. When the participants returned, they completed a post-test questionnaire. They were given a chance to leave the fish for someone else to adopt or to adopt it permanently.

Measures. The final questionnaire contained a battery of items to measure commitment and affection for the fish. To measure the participants' attachment to the fish, participants were asked if they wanted to keep the fish, and if they would sell the fish. They also were asked if they had spent any money on the fish and whether they had named it. They were asked to categorize their fish as a "decoration," "personal possession," "piece of furniture," or "guest," "friend," "companion," "child," "stranger" or "pet." Participants rated their liking for the fish on a 7-point scale.

Participants also were asked questions to assess their psychological explanations of their fish's behavior. They were asked to list three characteristics of the fish and to give an example to illustrate each characteristic. On 7-point scales, they were asked if the fish liked them, how smart the fish was, and if it had a similar disposition to their own.

We presented all participants with four scenarios in which they were to "imagine that [your/our] fish" exhibited the following behaviors: ". . .jumped out of its bowl," ". . .turned toward a visitor when the visitor approached," ". . .ate less when another person fed it," and ". . .swims around more when you sit nearby." (These behaviors were chosen from observations of the fish by experimenters before the study.) We asked participants to explain these behaviors, as in experiments 1 and 2, and to rate them on scales of instinct versus intentionality.

Coding. In this study we used three coding methods. First, two coders who were blind to condition independently coded whether the characteristics and examples given were anthropomorphic or not, based on the definitions of Berry et al. (1992) and used in experiment 2. Agreement between the two coders was 83.5% for the characteristics and 81.6% for the examples. The two coders discussed and resolved their disagreements.

Second, two coders, also blind to condition, coded the explanations of the hypothetical scenarios according to the Folk Explanation Scheme developed by Malle (2000) and used in experiments 1 and 2. The mean agreement rate across the four scenarios was 66%. A third coder resolved disagreements. In addition, the two coders who coded the explanations also coded whether the explanation was anthro-

pomorphic, based on Berry et al.'s (1992) definition as they used it to code the characteristics and examples. Mean agreement rate across the four scenarios was 79.56%. Again, a third coder resolved any disagreements.

Third, for each open-ended response, including the reports sent by email from participants during the two-week period, word counts were analyzed with the TAWC computer program (Kramer, Fussell and Setlock 2004). We counted the number of negative and positive emotional words, using Pennebaker, Francis and Booth's LIWC dictionary (2001) and gender related words (he, she, his, hers, her and him). The authors also created a new dictionary to measure the social psychological language of participants—their use of words such as "greet," "explore," and "sneaky." This category was developed in a manner specified in Pennebaker, Francis and Booth (2001). One author examined the texts and made a list of words considered social psychological. He passed this list to a second researcher, who approved or disapproved of these words and added more words to the dictionary. An author then did the same, and then the first two authors evaluated the entire list. Any word with two-thirds agreement was kept as part of the final dictionary. In total, 34 words comprised this dictionary of social psychological words.

Results

Participants varied in how diligently they cared for their fish, although only one participant treated his fish poorly; he left his fish in a dormitory bathroom, from which it was immediately rescued. By contrast, most participants developed a considerate relationship with their fish. One participant described taking her fish outside to "enjoy the sun." Still another took her fish home for a holiday weekend, secreting the fish in her backpack after airport security personnel refused to let her carry the fish through the scanner. Twenty-two percent purchased additional supplies or bowl decorations during the two weeks of the experiment. Sixty-nine percent said they would not sell the fish if asked to do so. At the end of the two-week study, all participants were asked to reaffirm their intention to own a fish; 84% of the participants adopted their fish permanently.

The analyses of the questionnaire data were performed using analysis of variance statistics, with the independent variables Ownership, Report Frequency, and the interaction of these variables. Some dependent variables were greatly skewed, and a log transformation was used in those cases (noted below). Overall, there were few significant effects of the Report Frequency manipulation, and we do not discuss this variable further (although all analyses include this variable as a control).

Relationship Closeness. The Owner condition created a significantly closer relationship between the participant and the fish than did the Caretaker condition. Owning the fish, as compared with taking care of the fish, increased participants' liking for the fish (6.1 [0.7] vs. 5.7 [1.3], $F_{(1, 81)} = 3.8$, $p = 0.05$, $d = 0.44$ [using log ratings]), the likelihood that participants gave the fish a name (82% vs. 62%; $\chi^2 = 3.8$, $p = 0.05$), and their propensity to keep the fish after the study (95% vs. 75%; $\chi^2 = 4.5$, $p = 0.03$).

Explanations. Generally, the Owner condition as compared with the Caretaker condition, did not directly increase participants' social descriptions and psychological explanations. For instance, participants in the Owner condition were just marginally more likely to liken their fish to a friend, family member, or pet than those

in the Caretaker condition, who tended to liken their fish to a decorative object ($\chi^2 = 4.4$, $p = 0.11$). By contrast, participants' affection for, and intention to keep, the fish significantly influenced their psychological explanations. Thus, for instance, those who rated their liking for the fish as 6 or 7 on the 7-point scale (that is, above the median) were significantly more likely to say the fish was a friend, family member, or pet, rather than a decorative object ($\chi^2 = 6.6$, $p = 0.03$).

Affection as an Independent Variable. In all subsequent analyses, affection for the fish is the independent variable of interest, operationalized as participants' scores on the 7-point liking scale. Because the data were highly skewed positively (median = 6), we used a log transformation of these scores in the analyses. The models also include the manipulated variables, Ownership and Report Frequency, and their statistical interaction.

Liking their fish predicted participants' ratings of how smart the fish was ($F_{(1, 75)} = 3.9$, $p = 0.05$, $d = 0.46$), how much participants said their fish liked them ($F_{(1, 74)} = 12.1$, $p < 0.001$, $d = 0.81$), and whether they claimed the fish had a similar disposition to theirs ($F_{(1, 75)} = 5.8$, $p = 0.01$, $d = 0.56$).

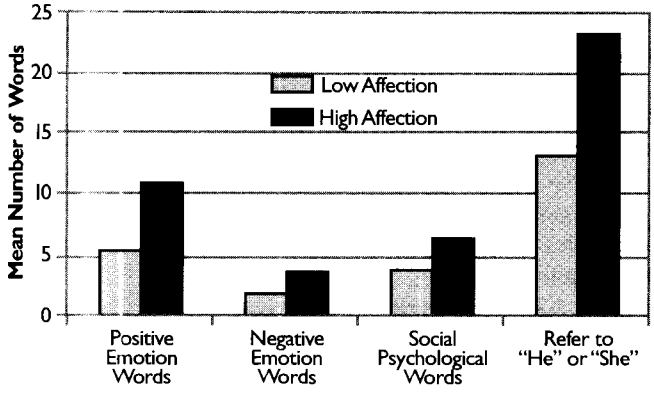
In blind coding using the Berry et al. (1992) scheme, participants' listed characteristics of their fish and gave examples of these characteristics. These answers were more social psychological ("anthropomorphic" in the Berry et al. scheme) the more participants said they liked the fish ($F_{(1, 74)} = 17.9$, $p < 0.001$, $d = 0.99$). Participants' affection for their fish also affected their explanations of the scenarios. Psychological explanations were more frequent the more the participant liked the fish ($F_{(1, 74)} = 3.5$, $p = 0.06$, $d = 0.43$), and there was an interaction effect, as well. That is, liking the fish did not increase psychological explanations of the scenario in which the fish jumped from the bowl, but liking increased psychological explanations of the three comparatively social behaviors: turning toward a visitor, eating less when someone else fed it, and swimming around when you sit nearby; interaction ($F_{(3, 72)} = 3$, $p = 0.03$, $d = 0.41$).

Using the Malle (2000) coding scheme for explanations of behavior, we found marginally significant effects: that participants' liking for their fish predicted somewhat higher ratings of intentionality ($F_{(1, 74)} = 3.2$, $p = 0.07$, $d = 0.42$) and greater use of all explanations, but particularly causal history of reasons ($F_{(1, 75)} = 3$, $p = 0.08$, $d = 0.33$).

Finally, as described above, we also used computer-assisted coding of the open-ended reports on the fish and answers to questions on the post-test, to count the use of positive and negative emotion words, psychological state or trait words, and references to the fish as "he" or, in a few cases, "she." The counts are averaged to control for number of words (particularly since those who reported daily wrote much more). In the reports from participants, liking for the fish predicted more positive emotional words ($F_{(1, 74)} = 4.1$, $p = 0.04$, $d = 0.47$), more negative emotional words ($F_{(1, 74)} = 4.7$, $p = 0.03$, $d = 0.51$), more words in the social psychology dictionary, ($F_{(1, 74)} = 6.5$, $p = 0.01$, $d = 0.60$), and more use of "he" or "she" ($F_{(1, 74)} = 4.8$, $p = 0.03$, $d = 0.51$). The results are shown in Figure 4, using a median split of high vs. low ratings of liking for the fish.

Similarly, in explanations of the scenarios the TAWC analysis showed that liking the fish predicted more words matched to those in the social psychological dic-

Figure 4. Words used in descriptions of a pet fish by those with more or less affection for the fish (Experiment 3).



Note: Affection scores split at the median (6) on the item asking participants how much they liked their fish. High Affection = 6 or 7 on 7-point scale vs. Low Affection = scores lower than 6.

tionary ($F_{(1, 74)} = 4.2$, $p = 0.04$, $d = 0.48$) and more positive emotion words ($F_{(1, 74)} = 5.5$, $p = 0.02$, $d = 0.55$).

In final analyses, we examined the effects of knowledge of fish and knowledge of people on psychological explanation. Knowledge of fish was reported to be generally low, and did not affect other results. The effect of self-reported knowledge of people was in the same direction as in experiment 1: higher knowledge led to more psychological explanation, but across our many measures was not consistently significant statistically.

Discussion of Experiment 3

This experiment, in which participants described a pet fish, was a conceptual replication of experiment 1, in which participants described the behavior of a target dog and person, and experiment 2, in which participants described the behavior of moving shapes on a computer display. The findings of the first two studies suggested that an imagined ownership relationship with a dog or object increases psychological explanation of its behavior. In the second study, we also measured affection for the objects. We found that positive feelings for the target object and its partnered object, and especially negative feelings for the "aggressive" object, were associated with the ownership manipulation and with psychological explanations of the objects' behavior. In our third experiment, ownership was associated with affection for the pet fish as well. Further, affection rather than ownership per se or amount of required observation of the fish accounted for significant variation in psychological explanations of the fish's behavior and in the use of language associated with psychological explanations. Thus, the experiment suggests that emotional attachment rather than the economic relationship of ownership or the amount of observation explains why owned objects and animals are more likely to prompt psychological explanations than objects or animals that are not owned.

General Discussion

We aimed to discover how the nature of people's relationship with a nonhuman might affect psychological explanations of its behavior. Our studies indicate that there is a social emotional aspect of psychological explanation that has not been addressed in cognitive science studies of how people explain object or animal behavior. Previous research in cognitive and brain science has shown that perceptions of lifelikeness and causality arise from automatic perceptual processing and mapping nonhuman behavior to apparently similar human social behavior. Also, people are likely to attribute to other beings the things they themselves know (Nickerson 1999). These basic processes do not explain why people use psychological description and explanation of some animals more than others, for example, zoo animals with names versus those without, pets versus farm animals, and our own dog versus another's dog.

Our first two experiments indicated that an ownership relationship with a nonhuman encourages psychological explanation. These results accord with studies showing that people who own possessions value them more highly than the possessions of others (Beggan 1992; Nesselroade, Beggan and Allison 1999, Pierce, Kostova and Dirk 2003, Kiesler and Kiesler 2005). Ownership also implies many other changes in a relationship—changes in knowledge, communication, attention, and feelings. Each of these changes can affect psychological explanation. For example, people pay comparatively more attention to the unobservable behavior of intimates versus strangers (Malle and Pearce 2001).

Our third experiment showed that ownership as compared with a caretaking relationship, led participants not only to value their fish more highly, but to name the fish, to be committed (in our study, measured as adopting the fish permanently), and to feel affection for the fish. These factors predicted psychological explanation directly whereas mere ownership did not. Other studies suggest that affection increases favoritism and inclusion of a pet into the extended self (Sivadas and Venkatesh 1995). Affection also may increase the likelihood of including a pet into an owner's social identity (for a human example of this social process, see Cross, Morris and Gore 2002).

Experiment 3 showed that the animal–human bond is intimately related to psychological explanation, but provided no evidence that frequency of interaction has a significant impact on either affection for the fish or psychological explanation. In a previous study, Parise et al. (1999) found that dog owners were more likely than people who did not own a dog to cooperate financially with a computer-animated dog. The authors speculated this difference might have derived from the dog owners' experience with dogs. Our current study suggests that the real reason for these results might have rested more in dog owners' emotional investment in their dogs, in line with Caporeal and Heyes' (1997) argument that psychological explanation is a way of changing the values we place on animals.

Our study examined only one dimension of social relationships that may encourage psychological explanations of behavior. We speculate other social processes are involved, as well. For example, a person's perceived compatibility or similarity to a pet or group of animals might lead to greater psychological explanations of its behavior (see Leyens et al. 2000). Social processes could work in the other direction, as well. For instance, some research suggests that people who are reminded of their

mortality tend to respond by distancing themselves from animals and considering animals to be more different from humans than they do without such threats (Goldenberg 2001). Social distance should discourage psychological explanation, as well.

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