

The cognitive and emotional consequences of anthropomorphic thought

by

Jesse J. Chandler

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Doctoral Committee:

Professor Norbert W. Schwarz, Chair
Professor Phoebe C. Ellsworth
Professor Eugene Burnstein
Professor Brad J. Bushman
Associate Professor Carolyn Yung-Jin Yoon

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If I have learned anything about psychology, it is that there is an appropriate William James quotation for any occasion, and the completion of a dissertation is no different. Together, my committee has underscored that “common sense and a sense of humor are the same thing, moving at different speeds. A sense of humor is just common sense, dancing.” In the spirit of this, I would like to extend particular thanks to Phoebe Ellsworth for her sometimes facetious but always wise moral support and methodological insight and to Gene Burnstein, for his sometimes absurdist but always insightful suggestions about how to develop and test these ideas.

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ABSTRACT

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Chair: Norbert Schwarz

Six experiments test how accessible anthropomorphic concepts affect thoughts and feelings about a variety of different objects (robots, vehicles and computers). Across these studies, people induced to think about objects in anthropomorphic terms (i) give less weight to product quality when making purchase and replacement decisions. Instead, they (ii) attend to features usually considered relevant in the interpersonal domain (such as neonatal features or connotations of “warmth”). Additionally, (iii) although people do not prefer new anthropomorphic products over non-anthropomorphized objects, they are generally more reluctant to replace anthropomorphized products that they already own, especially if they have an anxious interpersonal attachment style. Finally, (iv) people report experiencing more interpersonal emotions such as love and anger when thinking about anthropomorphized objects than when thinking about non-anthropomorphized objects. These effects occur even when the anthropomorphic cues are trivial and embedded within survey questions rather than a property of the object of judgment. Together these findings suggest that the categories of “human” and “nonhuman” are malleable and that social cognitive processes to be applied to objects, with potentially unforeseen consequences on emotional response and decision making.

Chapter 1

Introduction

From a distanced perspective, most people would agree that the world is clearly divided into the categories of “living” and “nonliving,” with very few cases where a target’s ontological status is a matter of serious debate (e.g. viruses). However, in practice there is a degree of malleability to these categories, as demonstrated by cross-cultural differences in what is consensually “human” and “not-human.” Animist cultures may view certain natural objects as possessing agency, while some subcultures in industrialized societies imbue technological artifacts (e.g. ships) with agentic properties (Guthrie, 1993). Further people will sometimes reason about nonliving objects in anthropomorphic terms even when they objectively know that they are not alive (e.g. ghosts; Bering, 2006) or that they are purely symbolic entities (e.g. brands; Aaker, 1997) if doing so assists in parsimoniously explaining or communicating their properties. Reflecting the tendency, anthropomorphic objects are commonly featured in movies and books intended for both children (e.g., *The Brave Little Toaster*, Disch, 1987) and adults (e.g., *2001: A Space Odyssey*, Kubrick, 1968).

Within individuals there is also variation in whether or not specific objects are anthropomorphized, depending on the presence of contextual cues that imply agency and the accessibility of socially relevant goals. Further, people sometimes treat objects as if they possess agency, even if they do not explicitly represent them in anthropomorphic

terms. Most of us at some point have argued (or pled) with a computer, felt attached to a favorite sweater or expressed love for a new car without much thought about the underlying anthropomorphic assumptions implied by these actions. Although contextual cues are important in almost all domains of thought, people may be especially sensitive to cues that imply the presences of other agents. Chapter Two briefly reviews the features that lead to rapid agent detection.

People apply specialized knowledge structures when reasoning about other people, acquire vast repertoires of information relevant to social situations and devote substantial energy to monitoring and communicating socially relevant information. People's reasoning about other agents is essentially egocentric (Ames, 2004). Although this tendency decreases as organisms become less similar to humans (Eddy, Gallup & Povinelli, 1993) people may still rely on their knowledge of human behavior as a starting point when reasoning about objects, resulting in qualitative differences in how people treat anthropomorphized and non-anthropomorphized objects. Chapter Three briefly outlines some of the previously identified consequences of anthropomorphic thought already identified through empirical research.

Anthropomorphizing an object shifts attention to features that are relevant when thinking about other agents at the expense of concerns that are typically relevant to objects. Chapters Four, Five, Six and Seven consistently demonstrate this general principle with a variety of novel and familiar objects and a variety of techniques used to activate agentic concepts. These studies extend previous work by using an experimental approach in which the accessibility of anthropomorphic thoughts is experimentally manipulated while holding the object constant and by demonstrating that

anthropomorphic cues influence not only what information people attend to, but also which information they ignore.

A second consequence is that interpersonally relevant feelings should influence decisions about anthropomorphized objects. Thus, people should also be reluctant to replace anthropomorphized objects as I demonstrate throughout this research. Chapter Eight highlights this by demonstrating that people who are chronically concerned about rejection are especially reluctant to replace objects following an anthropomorphic prime and also tend to express feelings of love towards anthropomorphized objects. However, interpersonal emotions are not always positive. Chapter Nine highlights the potential tradeoffs of anthropomorphism by demonstrating that people experience more anger after thinking of an anthropomorphized object that has failed them. Although the effects of anthropomorphic thinking are of relevance to a variety of different domains including politics, the economy and religion and have been studied using a variety of methods, these issues will be explored within the domain of consumer behavior using an experimental approach.

Novel Contributions

Taken together these findings suggest that people do not automatically and consistently anthropomorphize objects (as implied by correlational research, e.g. Aaker 1997; Moon & Nass 1996) but rather that people are sensitive to agentic cues. When these cues are present - either in the design of the object itself or in the mind of the perceiver - the likelihood that social-cognitive knowledge structures will be applied to objects increases. Together these findings demonstrate that the categories of “living” and

“nonliving” are fundamentally different yet malleable. They are fundamentally different in terms of the information that people attend to and the consequences of this information on thoughts and feelings. At the same time, they are malleable in that there is not necessarily consensus on what should be (implicitly) anthropomorphized and even trivial situational cues appear to influence how an object is categorized. Thus although cognition may often be domain-specific, the domain to which a target belongs may lie in the eye of the beholder.

Chapter 2

Causes of Anthropomorphism

Agency is a concept that provides causal explanations and predictions about a target of judgment rather than an ontological category in its own right. Mental attributes such as intentions, beliefs and desires are central to predicting the behavior of living agents yet not directly observable within any target except perhaps the self (Kirk & Squires, 1974). Instead their presence is inferred based on other observable properties of the target. As a result, what does and does not experience mental states is at best an educated guess.

Determining what is alive is an important task when forming a model of the environment and predicting future events because whether a target is living or not is central to determining the appropriate set of responses towards it. As a result, people are sensitive to cues that signal potential agency and readily apply knowledge about agents – often human agents - to any targets of judgment that could potentially be alive (Bering, 2006). Current conceptualizations of anthropomorphism identify three determinants of anthropomorphic thought: elicited agent knowledge, sociality motivation and effectance motivation (Epley, Waytz & Cacioppo, 2007). Elicited agent knowledge refers to features

of the stimulus that suggest that it is alive and includes both behavioral evidence that an object is living and superficial resemblance to known living kinds. Sociality motivation refers to people's desire to be around others, leading to vigilance for agents that can potentially fulfill this motivation. Effectance motivation refers to people's desire to understand their environments. As an individual difference, this is a somewhat messy variable as the prediction of the environment is central to most, if not all, anthropomorphic thought. However, individuals who are especially high in their need to understand their environment seem to be especially likely to endorse anthropomorphic beliefs for unexplained behavior (Epley, Waytz, Akalis & Cacioppo, 2008).

Dynamic aspects of objects

Past behavior is a good predictor of future behavior. Thus, the appearance of agentic "behavior" is the most diagnostic cue of future agentic acts. Motion (or "dynamic aspects" Gelman & Opfer, 2002) intuitively requires a cause and in the absence of external physical forces, internal forces (such as desires) can provide an explanation for an object's movements. Thus autonomous motion can imply agency. When objects that should not have agency demonstrate agentic behavior the apparent contradiction must be resolved. Poulin-Dubois, Lepage, and Ferland (1996) found that nine month old infants paid more attention and experienced more negative affect when inanimate objects moved and responded to verbal commands than when people did. The authors interpret this finding as demonstrating that infants are aware of what is and is not "supposed" to be alive and attend to apparent violations of this rule.

Motion remains an important cue of agency through the lifespan. Heider and Simmel (1944) demonstrated that adults spontaneously anthropomorphized moving shapes, invoking agentic concepts (i.e. intentions, beliefs and desires) to explain their movements (“the square desired to be friends with the circle”). Highlighting the importance of apparent motion, follow up experiments found that people will use agentic descriptions even when the video is highly pixilated to disrupt the continuity of the shapes themselves while preserving residual movement (Berry, Misovich, Kean & Barron, 1992). Similarly, people will ascribe agency to the actions of non-agentic entities (i.e. plants) when their movements are accelerated to more closely approximate the speed at which agents typically move (Morewedge, Preston & Wegener, 2007).

Although agentic concepts can, in principle, explain the actions of any target, they are most readily applied when the object’s motion fits closely with preexisting conceptions of agentic behavior (Woodward, 1999; Opfer, 2002; Opfer and Siegler, 2004). Opfer (2002) showed children of various ages and adults animated blobs moving either aimlessly or towards a “goal” (another amorphous blob). People of all ages were more likely to attribute agency to goal-directed blobs and were more likely than chance to infer that they had additional psychological and biological properties. This suggests that although motion that does not fit with other explanatory frameworks may lead people to resort to anthropomorphic explanations (which can explain just about any behavior), people are especially likely to do so when the pattern of motion fits with naïve psychological principles.

Featural aspects of objects

People also need to be able to identify whether a target has agency in the absence of any prior behavior, drawing upon the target's appearance alone ("featural aspects" Gelman & Opfer, 2002). Since detecting the presence of agents quickly is important than and false positives during agent detection (e.g. seeing faces in rocks and trees) have minimal consequences compared to false negatives (failing to perceive a predator or rival; Guthrie, 1993) people will readily infer agency, even when there is little behavioral justification for doing so (Atran & Norenzayan, 2004).

Faces are detected especially rapidly and with little effort relative to other objects (Purcell & Stewart, 1986) and this difference emerges shortly after birth (for a review see Liu & Chaudhuri, 2003). As a result, features that have even a passing resemblance to the human form such as symbolic "eyes" (Jones, Smith & Landau, 1991; Haley & Fessler, 2005; Jipson & Gelman, 2007) are readily anthropomorphized. Jones and colleagues (1991) found that children classified objects according to shape and not texture. However, when eyes were added to the objects, children classified them according to texture rather than shape. They explain this finding by noting that children know that texture tends to remain the same for living objects while they can change shape over both the short term (i.e. postural change, Becker & Ward, 1991) and the long term (i.e. growth; Rosengren, Gelman, Kalish & McCormick, 1991). The presence of symbolic eyes also leads children to make different inferences. Jipson & Gellman (2007) found that children were more likely to attribute biological properties to objects that had a face but were not alive (such as a robot) and occasionally failed to attribute biological properties to living objects that did not have a face (such as a starfish).

Other features that correlate with agentic behavior such as human-like forms, (Agarwal & McGill, 2007; Trampe, Stapel & Siero, 2007) or specific body parts, such as hands (Woodward, 1999) can elicit responses similar to those elicited by symbolic eyes. For example, Trampe and colleagues (2007) found that people dissatisfied with their bodies spontaneously compared themselves against illustrations of vases, evaluating themselves more negatively after viewing a thin vase than after viewing a wide vase.

Folk psychological theories are sufficiently complex that they can provide an explanation for virtually any behavior, making it difficult to disconfirm agentic beliefs about a target. Furthermore, since we experience mental states as “always on” even in the absence of perception or physical action, once we ascribe agency to a target, it may persist, even in the face of evidence suggesting that it is not alive. For example, Bering and Bjorklund (2004) asked children to imagine a mouse eaten by an alligator. They found that children understood that the mouse could no longer experience physical sensations, but they were far less likely to believe that the mouse could no longer think (Bering & Bjorklund, 2004). Likewise, when asked what characteristics were present or absent within a dead agent, adults took longer to make inferences about purely mental states than biological states (Bering, 2002). Thus agentic beliefs triggered by anthropomorphic cues are likely to persist in the face of ambiguous or even disconfirming evidence.

Perceiver characteristics

Features of the perceiver can also influence the likelihood that they will perceive agency. Consistent with goal-directed accounts of cognition (Fishbach & Ferguson,

2007), affiliation goals increase sensitivity to social cues (Gardener, Pickett, Jefferis & Knowles, 2007). Consequently, feelings of loneliness or isolation can make people more sensitive to the presence of other agents in the environment. Chronically lonely people are more likely to endorse anthropomorphic beliefs about objects and animals (Epley, Akalis, Waytz & Cacioppo, 2008) although at least among children, anthropomorphism does not necessarily predict social maladjustment or isolation (Gleason, 2004). Likewise, people primed to think of social isolation are more likely to select adjectives related to social support when describing their pets, suggesting that people may strategically emphasize anthropomorphic characteristics of targets that fulfill social needs.

Similarly, competency goals lead people to perceive illusory patterns in randomly occurring stimuli (Whitson & Galinsky, 2008). Agentic beliefs provide meaning to otherwise inexplicable events. Thus, people who are chronically high in the need for control are especially likely to believe in god or other supernatural agents (Sales, 1972) and are more willing to ascribe agentic traits to animals (Epley, Waytz, Akalis & Cacioppo, 2008).

Ecologically diagnostic cues of agency have been the primary focus of study for researchers interested not only in the causes of anthropomorphism, but also the consequences of anthropomorphic thought. Indeed, many studies examine both potential causes and consequences simultaneously. The manipulation of ecological features of an object is essential for understanding the causes of agent detection, but problematic for understanding the consequences of inferring agency for reasons that will be discussed below. However, even though there are specialized neural pathways for the processing of perceptual inputs relevant to agent detection (Liu & Chaudhuri, 2003) and for processing

downstream inferences about agents (Ermer et al., 2006) the general principles by which agentic concepts are rendered accessible as outlined above is consistent with more general knowledge accessibility models (for a review see Higgins, 1996). This suggests that anthropomorphic beliefs about objects could also be manipulated using semantic primes rather than manipulating the features intrinsic to the object as is typically done in experimental studies on anthropomorphism

Chapter 3

Consequences of Anthropomorphism

Most of our knowledge about other agents is either drawn from our experience with our own mental states, or our observations of the behavior of other people. Thus, agentic beliefs about targets are always implicitly, and sometimes explicitly anthropomorphic. As a result, thinking of objects as alive typically equates to thinking of objects as if they were human. When thinking about objects and people, there are important differences in the processing of information, both at a neural level (Mitchell, Heatherton & Macrae, 2002; Yoon, Gutchess, Feinberg & Polk, 2006) and in self-report and behavioral measures (e.g. Cosmides, 1989). Thus whether a target is categorized as living has consequences for what information comes to mind and what predictions seem plausible when thinking about the target. The speed at which agents are detected in the environment and the ease with which anthropomorphic concepts are applied suggests that this process can occur more or less automatically, and does not require that people explicitly endorse that the object is alive.

Object perception as person perception

A great deal of correlational and quasi-experimental research supports the general prediction that people reason about anthropomorphized objects as if they are people.

Heider and Simmel (1944) noted that people used knowledge about social categories when describing shapes by making appeals to gender and relational schemas as a part of their explanations. Subsequent studies suggest that social cognitive processes and preexisting social knowledge can also influence the evaluation of objects. For example, products packaged together are usually expected to be of identical size; however, when thinking in terms of products in terms of “product families” people tend to prefer objects of different sizes that are packaged as a single unit over objects of identical size (Agarwal & McGill, 2007). Likewise, people rated a computerized “tutor” with a male voice to be more informative than a computerized tutor with a female voice when the topic of study was computers while the reverse was true when the topic of study was relationships (Nass, Moon & Green 1997).

Further evidence for anthropomorphic thought comes from studies that observe parallels between the characteristics people attend to when evaluating other people and the characteristics people attend to when evaluating objects. For example, people prefer computers with personalities similar to their own (Moon & Nass, 1996; Nass, Moon, Fogg & Reeves, 1995) as well those with whom they are interdependent or share coalitional membership (Nass, Fogg & Moon, 1996). Together these findings indicate that people attend to interpersonally relevant features when considering novel objects that possess anthropomorphic cues.

Relationships with objects

People can also enter into “parasocial” relationships (Horton & Wohl, 1956) with anthropomorphized objects that may approximate human relationships suggesting that

when people think about anthropomorphized possessions, information relevant to relationships will also assume prominence. The formation of parasocial relationships between people and objects were once viewed as a transitory phase in children's development (Winnicott, 1953) but both children (Hood & Bloom, 2008) and adults report entering into relationships with objects (Thomson, MacInnis & Park, 2005; Ball & Tasaki, 1992; Fournier, 1998). As a consequence, people apply relational scripts when interacting with non-living entities. Children who have imaginary friends appear to describe these relationships in a manner that is similar to how they describe real friendships (Gleason, Sebanc & Hartup, 2002).

Among adults, reciprocity norms are obeyed when interacting with objects. For example, people spent more time making aesthetic judgments to help a computer optimize its choice of colors to human taste when the computer first provided useful search information than when it first provided useless information (Fogg & Nass, 1997). Conversely, people are sensitive to when anthropomorphized objects do not live up to their end of the relationship. Agarwal (2004) found that consumers reacted negatively when they were led to believe that a bank "brand" would adhere to communal norms but then violated them (i.e. by charging a fee for a bounced check in a communal relationship).

Politeness norms are also obeyed when interacting with objects. Nass, Moon and Carney (2006) found that people adhere to politeness norms when interacting with machines, writing more favorable evaluations of a computer when typing directly on it than when writing the evaluation on an identical computer in another room. People are also more likely to adhere to social norms towards others in the presence of agentic cues.

Thus they divide resources more equally and are more likely to contribute to public goods when in the presence of symbolic eyes (Haley & Fessler, 2005; Bateson, Nettle & Roberts, 2006).

Anthropomorphism and interpersonal emotions

Once consumers enter into a relationship with an object, the emotional quality of their experience with the object may resemble the emotional quality of their experience with other people. Social interaction is pleasurable and imbuing a product with anthropomorphic cues leads consumers to experience more positive affect when interacting with it. Wang and colleagues had consumers use an online shopping website that either had a virtual interactive tour guide or consisted of a text only interface. They found that consumers interacting with the virtual tour guide reported more positive affect, more arousal, a greater sense of flow and greater purchase intentions and that all of these variables were mediated by perceptions of website sociability (Wang, Baker, Wagner & Wakefield, 2007).

Indeed, even in the absence of anthropomorphic cues, some consumers spontaneously experience uniquely social emotions when interacting with objects, including love (Schultz, Kleine & Kerman, 1991) and trust (Aaker, Fournier & Brasel 2004). Over time connections to special products and objects can grow, leading consumers to form a sense of attachment that may parallel interpersonal attachment patterns (Ball & Tasaki, 1992; Bowlby, 1969). Much like in interpersonal relationships, consumers can come to depend on objects, feeling a sense of security when they are close and distress when they are absent (Thomson et al., 2005). Some companies have

experimented with capitalizing on customers' feelings of loyalty to reduce business costs. For example, Zipcar decided to name all of its rental vehicles and reported that this led customers to be more diligent about cleaning and maintaining them (Levine, 2009). In combination, these observations suggest that consumers should be less willing to replace a product they own when they think about it in anthropomorphic terms.

In a relational context, social features of identity are particularly salient and people are more likely than not to behave in a manner consistent with accessible features of identity (Oyserman, 2009). As a result, social relationships are maintained even when they require costly sacrifices (Simmons, Marine & Simmons, 1977) and people routinely invest resources in caring for the old, the sick and the weak, even when they can no longer serve a useful function (Branscombe, Wann, Noel, & Coleman, 1993; Levine & Moreland, 2002).

In combination, these considerations suggest that when consumers think about a product in anthropomorphic terms they should focus on attributes relevant to people rather than attributes relevant to objects. As a result, when considering products to purchase they should be (i) less likely to evaluate products according to their utilitarian attributes and (ii) more likely to consider attributes that are important in the interpersonal domain. When considering objects they already own, a similar logic should apply, but additionally, they should (iii) be reluctant to replace them following an anthropomorphic prime, reflecting people's willingness to maintain interpersonal relationships, (iv) especially if the strength of interpersonal relationships is a chronic concern. Finally, anthropomorphizing an object should lead to interpersonal emotions. Thus, when people experience a product failure they should (v) report experiencing more anger (an

interpersonal emotion) but not report experiencing more negative emotions that Such as sadness or guilt that do not require appraisals of other-agency.

Chapter 4

Interest in Adult and Neonatal Anthropomorphized Products

Consumers select products for a variety of reasons including communicating their identity to themselves and others, the pleasure experienced when purchasing or consuming a product and the product's utility. Consumer motives vary as a function of a product's uses and consumers tend to prefer products that can fulfill its expected functions. For example, consumers' preferences for food brands are driven by the hedonic quality of the consumption experience while preferences for cleaners are driven by their utilitarian qualities (Batra & Ahtola, 1991). Whether the product can fulfill its intended function usually trumps incidental features of the product such as brand image and brand personality (Zentes, Morschett & Schramm-Klein, 2008). In a study of retail store brands, Zentes and colleagues found that the effect of store performance on attitudinal and behavioral measures of customer loyalty far exceeded the effect of customers' perceptions of brand personality.

Anthropomorphizing a product should reduce the usually observed link between product utility and consumers' desire to purchase it. In the social realm, instrumental

considerations are diluted by a number of additional features that must be integrated into a unified evaluation of the target. People serve many roles in each other's lives above and beyond utilitarian exchange and the fulfillment of these roles is not easily substitutable (Foa & Foa, 1974). Additionally, considerations of the intentions behind actions (Falk, Fehr & Fischbacher, 2008), communality and relational status often trump considerations of instrumentality, like the actual contributions of the other's skills and competence to one's own outcomes (Wojciszke, Bazinska & Jaworski, 1998; for a recent review see Ybarra et al. 2008). Thus it would be expected that people's preference for an anthropomorphized product would be less dependent on whether or not it successfully serves any useful function.

Further, anthropomorphizing a product should lead consumers to be attracted to products that have features that elicit an affiliative response toward other people. People (and other mammals) are attracted to other agents that display "cute" neonatal features such as large closely-spaced eyes positioned below the horizontal midline of the skull (*Kindchenschema*, Lorenz, 1946 as cited by Lobmaier, Sprengelmeyer, Wiffen & Perrett, 2010). For example, people (especially women) pay more attention to infant faces than adult faces (Brosh, Sander & Scherer, 2007) and look at prototypically cute infant faces for longer (Hildebrandt & Fitzgerald, 1978). Cute faces also influence the evaluation of adults. For example, people with "baby-faces" are perceived as more caring honest and warm (Berry & McArthur, 1985). Although some studies suggest that these biases may be specific to same-species infants (Brosh et al., 2007), anecdotally, animals will occasionally care for infants of other species, suggesting that like other processes

downstream of agent detection, care-giving responses are sometimes erroneously applied to incorrect targets.

Thus it can be expected that when rating anthropomorphized objects, consumers should generally prefer products with “cute” facial features over objects with adult facial features and may prefer anthropomorphized objects in general over non-anthropomorphized objects. Further, regardless of how cute a product is, the presence of anthropomorphic cues should undermine the influence of instrumental considerations on product preferences. To test this, participants were presented with a picture and short description of a real but likely unfamiliar floor cleaning robot called “Scooba” that was digitally manipulated to have adult or infant like anthropomorphic features or no anthropomorphic features at all. They rated how much they wanted to purchase a product like this before indicating how much time they spent cleaning their floors. The amount of time that the product would save them should be a less relevant consideration in the anthropomorphism conditions than in the non-anthropomorphism condition. Furthermore, to the extent that neonatal features elicit care-giving, consumers should want an “infant” Scooba of their own.

Method

American participants ($N = 113$) were recruited online from Mechanical Turk and invited to complete a survey on “product perceptions” in exchange for \$ 0.25.

Mechanical Turk is a crowd-sourcing that connects workers and employers. Previous research has shown that this population is generally representative of the US population as a whole, although it tends to be somewhat younger, poorer and more educated (for a discussion of Mechanical Turk population characteristics and recruitment norms see

Paolacci, Chandler & Iperotis, 2010). They were randomly assigned to view one of three different pictures of a “Scooba” floor cleaning robot: A Scooba with symbolic eyes (“adult” Scooba), a Scooba with symbolic eyes that were relatively larger and closer together (“infant” Scooba) and a third Scooba without symbolic eyes (control Scooba; Figure 1). Subsequently, participants rated how much they wanted a Scooba of their own (1 = *not at all interested*, 7 = *very interested*). Finally, they indicated how much time they spent cleaning hard surface floors each week in a free response format and answered additional demographic questions.

Results

Interest in purchasing the Scooba was regressed on the amount of time participants spent cleaning hard surface floors, dummy coded condition variables representing the “adult” and “infant” Scoobas and the interaction between time spent cleaning and condition. Overall, participants who spent more time cleaning their floors were more interested in purchasing a Scooba, $\beta = -.45$, $t(110) = 3.26$, $p < .01$.

This was qualified by an interaction between time spent cleaning and condition. Specifically, the relationship between time spent cleaning and the desire to own a Scooba was attenuated for both the adult, $\beta = .21$, $t(110) = 1.93$, $p < .06$, and infant Scooba, $\beta = -.29$, $t(110) = 2.36$, $p < .05$ (Figure 2). Expressed differently, there was a significant correlation between the time people spend cleaning hard surface floors and their desire to own a Scooba in the control condition, $r(35) = .49$, $p < .001$, but not in the adult Scooba, $r(39) = .03$, or infant Scooba, $r(36) = -.04$ conditions. This suggests that anthropomorphic primes shift attention away from the utilitarian value of the product.

Finally, although participants were not more interested in purchasing the adult Scooba than the control Scooba, $t < 1$, they were more interested in purchasing an infant Scooba than either the control or adult Scoobas, $\beta = .21$, $t(110) = 1.96$, $p = .05$.

Discussion

This study suggests that imbuing a product with agentic features, such as symbolic eyes, undermines the relationship between the utility of the product and consumers' desire to own it. Further, although consumers are not unequivocally more interested in purchasing anthropomorphic products, they are more willing to consider purchasing a product with "cute" anthropomorphic features. Since the influence between instrumental considerations and replacement intentions was attenuated for both the adult and infant Scooba, it is unlikely that people's preference for the infant Scooba is the result of more salient anthropomorphic cues. Rather, it is more likely that this difference reflects the positive connotations of cute facial features.

Skeptics may wonder whether the results generated by this approach reflect the spontaneous application of social knowledge to objects as opposed to the influence of pragmatic linguistic or situational considerations. This is a concern that applies more generally to research on the consequences of anthropomorphic thought. From this perspective, the presentation of novel objects with human features may convey that the object is to be thought about in human terms – or why else would it be endowed with these features? Hence, the observation of apparent agentic beliefs about an anthropomorphized object may, at least in part, be the result of pragmatic inferences about the intentions of the communicator (Schwarz, 1996). I address these limitations in

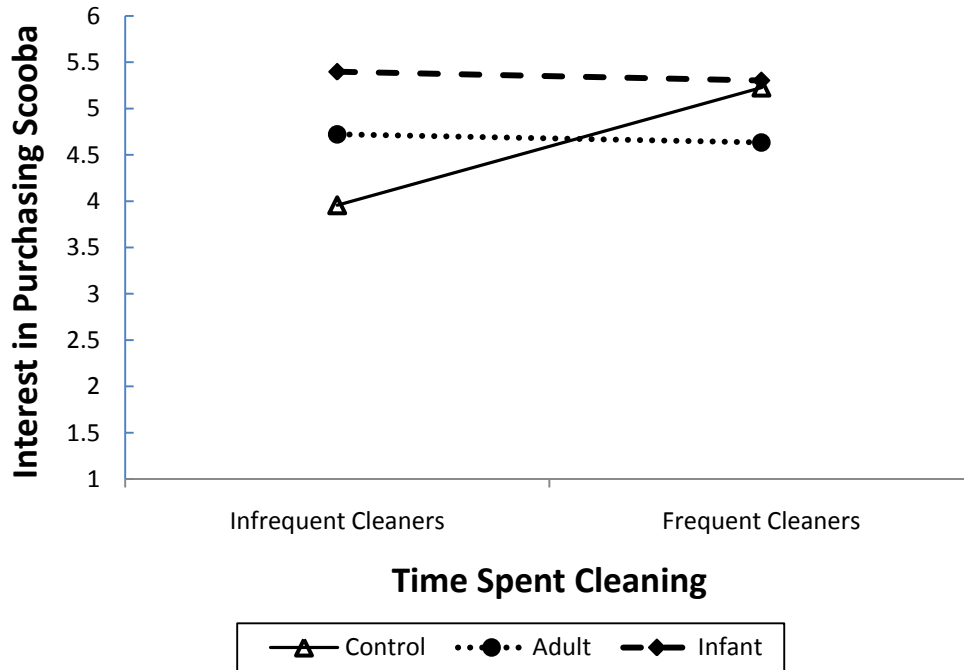
the next study by manipulating the frame that people use when describing an object while holding the object constant.

Figure 1: Target stimuli used in experiment one



From left to right: control Scooba, adult Scooba and infant Scooba.

Figure 2: Influence of time spent cleaning on product desirability



The relationship between time spent cleaning hard surface floors and people's interest in purchasing a Scooba. The adult Scooba had small eyes, the infant Scooba had larger eyes below the horizontal midline while the control Scooba had no eyes (Figure 1) Frequency of cleaning hard surface floors is plotted one standard deviation below and above the mean.

Chapter 5

Replacing Anthropomorphized Objects

Neglect of the instrumental contributions of others is, if anything, more likely when deciding whether to maintain of old relationships than when deciding whether to form new relationships. People maintain interpersonal bonds with relatively little regard for the instrumental contributions offered by others (Leach, Ellemers, & Barreto, 2007; Jones & Vaughan, 1990) and retain feelings of loyalty even to groups to which they no longer belong (Moreland & McMinn, 1999). In addition to the features that people typically consider when interacting with a novel other (such as morality), qualities of the relationship itself further dilute attention to instrumental features of close others. These theoretical considerations, in conjunction with the data from the study reported in Chapter 3 suggest that when people anthropomorphize possessions, replacement intentions should be unrelated to the physical qualities of the object.

Further, powerful social norms prevent the easy dissolution of interpersonal relationships (Ybarra et al., 2008). This suggests that although people may not be any more willing to purchase anthropomorphized products, they may be especially reluctant to replace anthropomorphized products that they currently own. In order to avoid some of

the methodological issues inherent in previous studies on anthropomorphism this prediction is tested by holding the objects people think about constant (computers that people already own) while manipulating whether it is thought of in psychological terms or not.

Method

Participants ($N = 127$) were recruited from the introductory psychology pool of a large mid-western university and completed the study online for credit. They were told: “We are conducting research on metaphors. You will be presented with a number of questions designed to examine how people interpret metaphors. Some of the metaphors may seem strange, but we would like you to try your best to answer them as best you can. After each metaphor, we will ask you a number of factual questions in order to understand your responses.”

In order to minimize demand characteristics, attention was shifted away from the dependant variables of interest by embedding the task in a series of other metaphors and by emphasizing that participants’ descriptions of the metaphors themselves were the dependant variable of interest. All participants completed several free-response warm up questions followed by specific questions relating to the topic and vehicle of the metaphor (e.g. “In what way is a basketball player a skyscraper?” followed by questions about basketball players and skyscrapers). Next, participants assigned to one of the three experimental conditions wrote about the way in which their computer was either a family member (Kin condition), a best friend (Friend condition), or a tool (Tool Condition; “In what way is your computer your brother/best friend/a tool?”); participants assigned to the Control condition made no metaphorical comparison for their computer. Subsequently,

participants were asked to describe their computer in their own words and reported how likely they were to replace it within the next 24 months (1 = *not at all*, 7 = *very much so*).

Participants' open-ended descriptions of their computers were rated for valence by two coders blind to condition and the hypotheses of the experiment. Agreement between coders was high (intraclass correlation = .90, $p < .001$) and their scores were averaged to form an index of computer quality (-3 = *extremely negative description*; +3 = *extremely positive description*).

Results

Coders' ratings of participants' open-ended descriptions of their computers suggested that thinking of a computer in metaphorical terms resulted in a significant increase in the positivity of the descriptions, suggesting that *all* metaphors brought positive features of the computer to mind compared to the tool and control conditions. Although people described anthropomorphized objects in more positive terms (kin, $M = 1.55$, $SE = .21$; friend, $M = 1.25$, $SE = .22$) than non-anthropomorphized objects (tool, $M = 1.13$, $SE = .21$; control, $M = .73$, $SE = .21$), $F_{contrast}(1, 121) = 3.27$, $p < .08$, $\eta_p^2 = .03$, an inspection of the means suggests that the most parsimonious explanation is that thinking about one's computer in metaphorical terms had a positive effect on descriptions, independent of whether the metaphor was anthropomorphic (kin, friend) or not (tool). Contrasts adjusting for the number of conducted and implicit contrasts (Contrasts: kin 1, friend 1, tool 1, control -3; kin 3, friend 1, tool -2, control -2; anthropomorphic v. non-anthropomorphic, each of the anthropomorphic metaphors against the other conditions; see Rosenthal, Rosnow & Rubin, 2000) confirmed that this was in fact the case, $F(1, 121) = 6.98$, $p_{adjusted} < .05$, $r_{contrast(adjusted)} = .18$.

Turning to participant's willingness to replace their computers, participants wanted to replace their computer less when they had thought of it as a brother ($M = 1.76$, $SE = .35$) or as a friend ($M = 1.73$, $SE = .37$) than when they had thought of it as a tool ($M = 2.50$, $SE = .37$) or who did not think of their computer in metaphorical terms (control condition, $M = 2.72$, $SE = .36$). As expected, planned contrasts with the valence of the description included as a covariate revealed that anthropomorphizing a computer made consumers less willing to replace it, $F(1,120) = 4.25$, $p < .05$, $\eta_p^2 = .03^i$, whereas the use of the non-anthropomorphic tool metaphor did not affect replacement intentions relative to the control condition, $F < 1$.

Just as instrumental considerations did not influence people's desire for anthropomorphized products in the previous study, the perceived quality of the computer should not influence replacement intentions for anthropomorphized products. To test this hypothesis, participants' willingness to replace their computer was regressed on computer quality, a dummy coded variable comparing anthropomorphic versus non-anthropomorphic conditions and the interaction between these variables. Reflecting the main effect discussed above, participants in the anthropomorphism conditions were less willing to replace it, $\beta = -.43$, $t(120) = 3.47$, $p < .001$. Additionally, as perceived computer quality increased, willingness to replace it decreased, $\beta = -.42$, $t(120) = 3.69$, $p < .01$. More important, these findings were qualified by the predicted interaction between anthropomorphism and computer quality, $\beta = .42$, $t(120) = 2.78$, $p < .01$. As shown in Figure 3, more negative descriptions of the computer's quality predicted participants' willingness to replace their computer in the non-anthropomorphic conditions, $\beta = .35$, $t(60) = 2.89$, $p < .01$, but not in the anthropomorphic conditions, $\beta = .10$, $t(61) < 1$.

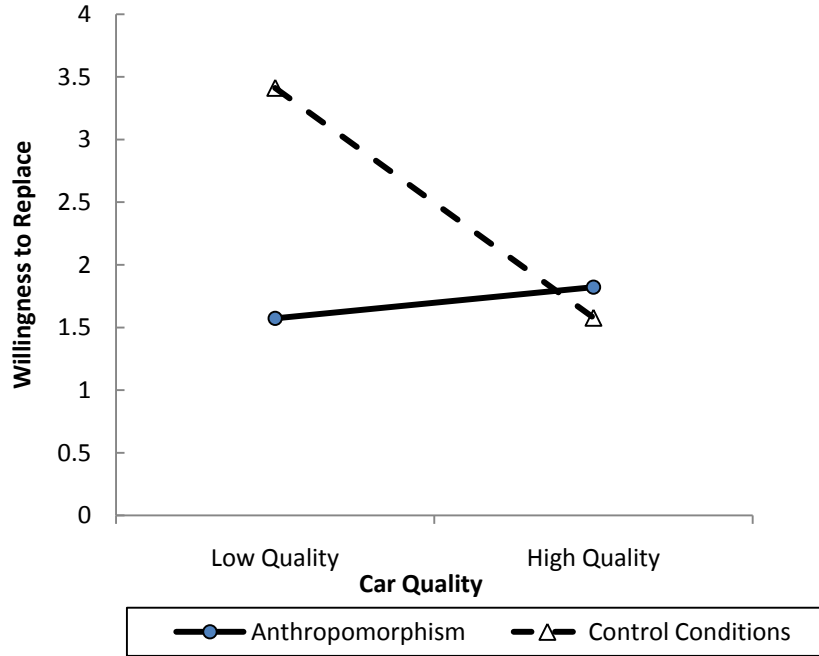
Discussion

In sum, thinking about their computers in terms of *any* metaphor increased the positivity of participants' descriptions, independent of whether the metaphor was anthropomorphic (Kin and Friend conditions) or not (Tool Condition). Presumably, this is because all three metaphors draw attention to positive features of the computer, although the precise features that people think about may differ across conditions. More important, *only* anthropomorphic metaphors reduced participants' willingness to replace their computers and this effect held even after controlling for the positivity of their description of their computer. In contrast, participants who thought of their computer as a tool were just as likely to replace it as control group participants, despite having provided a more positive description. Finally, the positivity of participants' descriptions of their computers predicted their willingness to replace it in the tool condition and the control condition, but was unrelated to replacement intentions in the anthropomorphic metaphor conditions. While these findings are consistent with our theoretical rationale, two possible alternative accounts deserve attention.

First, although the anthropomorphism manipulations were embedded in a set of questions about other metaphors, it is possible that demand characteristics contributed to their findings. Specifically, it may be difficult for people to say they will replace an object that they had just described as a friend or a family member, regardless of whether they accept the anthropomorphic premise. Second, thinking about one's computer as a friend or family member may prime positive attributes that may otherwise not come to mind and these attributes, rather than anthropomorphic thought per se, may have reduced reported replacement intentions. Inspection of participants' free-response descriptions of

their computers provides no apparent support for this possibility; moreover, the above results were obtained while controlling for positivity of the description. Nevertheless, a replication that avoids this ambiguity would be welcome. I address these concerns in the next study by replicating the findings reported above using a more subtle manipulation of agentic concepts.

Figure 3: Influence of product quality on replacement intentions in Chapter 5



Willingness to purchase a replacement computer it in the next 12 months as a function of experimental condition and the quality of the computer. Participants in the anthropomorphism condition described either how their computer was their best friend or their brother. Control conditions either described the way their computer was a useful tool or wrote nothing. Computer quality was evaluated by coding participants' descriptions of their computers. Low and high values are plotted one standard deviation below and above the mean.

Chapter 6

Subtle Agentic Cues and Replacement Intentions

To address the potential demand characteristics inherent to the experiment reported in Chapter Five, this study uses a less direct manipulation of anthropomorphic thought. Instead, we ask participants to simply evaluate a product using scales anchored in psychological or physical terms. Following this manipulation, participants describe the product in their own words and report how likely they are to replace it in the near future.

Method

Participants who owned cars ($N = 92$) were prescreened from an undergraduate subject pool and completed the study online for partial course credit. They were randomly assigned to one of three conditions (anthropomorphism, object, and control) and told that the survey explored “what people think about their cars.” Participants assigned to the anthropomorphism condition first rated their car on five bipolar scales anchored with personality traits (*reserved - enthusiastic*, *quarrelsome - sympathetic*, *dependable - irresponsible*, *open to new experiences – uncreative*, and *anxious - calm*), whereas participants assigned to the object condition rated physical attributes of their car (*quiet – loud*, *unresponsive – responsive*, *unreliable – reliable*, *versatile – limited*, *shaky -*

smooth) while participants assigned to the control condition completed neither of these scales. Subsequently, participants described their car in their own words and rated the likelihood that they would replace their car before they left college (1 = *not at all*, 7 = *very much so*).

Results

Pilot testing and manipulation check.

Pilot testing using a different sample revealed that in a free association task, people spontaneously listed more agentic nouns (people or other living entities) following presentation of the anthropomorphism adjectives than the object adjectives, $F(1, 18) = 45.33, p < .001$, confirming that the personality adjectives are more likely to bring anthropomorphic concepts to mind.

Within this sample, participants' descriptions of their cars were coded for the presence of anthropomorphic language by two independent coders. Anthropomorphic language included mentioning that their vehicle had a name, use of animate pronouns (he/she), elaboration of the vehicle's "personality" using agentic trait descriptions beyond those provided in the rating scales, and the use of interpersonal emotions (e.g. "love"; Schultz et al., 1991) when describing their attitude toward their car. Agreement between coders about the presence of anthropomorphic language was excellent, $\kappa = .88$ (Fleiss, 1981). A chi-square analysis revealed that participants were more likely describe their car in anthropomorphic language in the Anthropomorphism condition(48%) than in the object (29%) or control condition (15%), $\chi^2(2,90) = 8.41, p < .02$. This confirms that our manipulation worked as intended.

Participants' open ended descriptions of their cars were also coded for valence by two coders blind to conditions and hypotheses (intraclass correlation = .80, $p < .001$); the coders' ratings were averaged to create a composite measure of perceived car quality (-3 = *extremely negative description*; +3 = *extremely positive description*). Planned contrasts were computed to compare the anthropomorphism condition to the other two conditions and both ratings scale conditions to the no-rating control condition; neither of these contrasts showed a difference in overall valence of participants' descriptions of their car, $F_s < 1$.

Hypotheses tests.

Next I turn to participants' willingness to replace their car. A planned contrast (Rosenthal et al., 2000) comparing the Anthropomorphism condition to the other two conditions confirmed that participants reported less intention to replace their car if they rated its personality characteristics (anthropomorphism condition, $M = 2.23$, $SD = 1.54$) than if they rated its technical characteristics (object condition, $M = 3.14$, $SD = 2.24$) or provided no ratings (control condition, $M = 3.15$, $SD = 2.04$), $F(1,89) = 4.52$, $p < .04$, $\eta_p^2 = .05$. Follow up contrasts revealed that the anthropomorphic condition differed from the object condition, $F(1, 89) = 3.21$, $p < .05$, one-tailed, as well as the control condition, $F(1, 89) = 3.55$, $p < .05$, one-tailed, whereas the latter two conditions did not, $F < 1.2$.

To test whether this pattern implies the predicted dissociation between perceived product quality and replacement intentions, we analyzed the relationship between the valence of participants' open ended car descriptions and their replacement intentions in the anthropomorphic and non-anthropomorphic conditions using regression. Replacement

intentions were regressed on a contrast code comparing the anthropomorphic condition to the object and control conditions (for a discussion of planned contrasts in regression analyses see Cohen, Cohen, West & Aiken, 2003). Overall, participants reported higher intentions to replace their car the more negatively they had described it, $\beta = -.50$, $t(87) = 4.17$, $p < .001$, as one would expect. In addition, they reported lower intentions to replace their car when they had thought about it in personality terms, $\beta = -.21$, $t(87) = 2.21$, $p < .03$, reflecting the findings discussed above. More important, however, these main effects were qualified by an interaction between anthropomorphic prime and car quality, $\beta = .25$, $t(87) = 2.10$, $p < .05$, shown in Figure 4. An examination of the simple effects revealed that whereas poor quality reports were associated with increased intention to replace in the object and control conditions, $\beta = -.45$, $t(58) = 3.56$, $p < .001$, intention to replace was unrelated to quality in the anthropomorphic condition $\beta = -.12$, $t(28) < 1$.

This pattern is also reflected in the correlations between quality descriptions and replacement intentions. The more positively participants described their car, the less willing they were to replace it in the object condition, $r(22) = -.50$, $p < .02$, followed by the control condition, $r(26) = -.32$, $p < .10$. In contrast, the relationship between these variables was small and not significant in the anthropomorphism condition, $r(24) = -.15$, $p > .4$, as observed in the regression.

Discussion

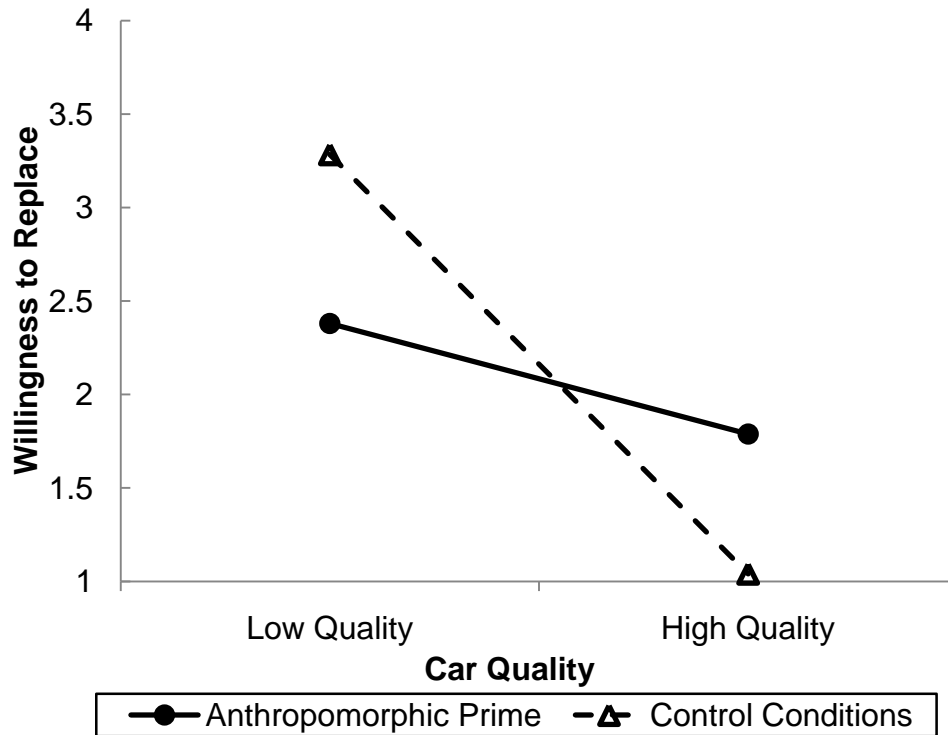
In sum, participants described their cars using more anthropomorphic and interpersonal language when a preceding question asked them to rate their car on personality traits rather than technical characteristics, confirming the successful induction

of anthropomorphic thoughts. While the anthropomorphism manipulation did not affect the valence of participants' open ended descriptions of their cars, it did affect their replacement intentions. As predicted, participants (i) reported lower replacement intentions when they were induced to think about their car in anthropomorphic terms. Moreover, (ii) perceived product quality, as coded based on the valence of participants' open ended descriptions, predicted replacement intentions in the absence of anthropomorphic primes, but was unrelated to replacement intention when anthropomorphic beliefs were primed. These findings provide first evidence that anthropomorphism can decouple product quality and replacement intentions, consistent with the conjecture that consumers may hesitate to replace anthropomorphized possessions just because they get unreliable, much as they hesitate to replace close friends just because they get old and cranky.

Nevertheless, two methodological concerns deserve attention; both pertain to unintended effects of our anthropomorphic thought manipulation. First, the personality traits we used as anthropomorphic primes may also have primed *other* positive features of the product. These features may be unrelated to anthropomorphic thought per se, but may result in more positive evaluations and hence lower replacement intentions. Second, rating the car on physical characteristics vs. personality characteristics may not only have primed physical vs. anthropomorphic concepts (as was intended), but also the rated attributes themselves may have differential evaluative implications. Both of these concerns imply that differences in anthropomorphic thought may be confounded with a differential accessibility of valenced attributes of the car. Empirically, the data provide no support for this conjecture. Any difference in the accessibility of valenced attributes

should be reflected in participants' subsequent free-response descriptions of their cars; yet these descriptions showed no difference in valence ($F < 1$).

Figure 4: Influence of product quality on replacement intentions in Chapter 6



The relationship between description valence and people's willingness to replace their car before they leave college. Participants in the anthropomorphism condition filled out a personality questionnaire for their car. control conditions either rated their car on non-anthropomorphic traits or did not rate their car. Description valence was evaluated by coding participants' descriptions of their cars. Low and high values are plotted one standard deviation below and above the mean.

Chapter 7

Connotations of Warmth and Replacement Intentions

The studies presented in Chapters Five and Six demonstrate that in the absence of anthropomorphic thought, consumers base their replacement intentions on the perceived quality of the product, but do not attend to product quality once the product is anthropomorphized. This observation is consistent with the assumption that instrumental considerations loom larger in the impersonal than in the personal world. By the same token, however, features that are valued in the interpersonal domain should be *more* likely to affect product replacement intentions when consumers are induced to think about the product in anthropomorphic terms than when they are not. Support for this hypothesis was found in Chapter Four, where people demonstrated a preference for anthropomorphized objects with neonatal features. However this study was limited in that the anthropomorphic prime was not independent of the socially relevant feature, thus it does not clearly demonstrate that some features assume relevance for anthropomorphized objects that would otherwise be ignored for non-anthropomorphized objects.

In order to test this hypothesis more directly, this study manipulates participants' perception of whether their car's color is "warm" or "cold." While objects are evaluated

according to their utility, people are evaluated according to both their potential instrumental contributions (“intellect”; Rosenberg, Nelson & Vivekananthan, 1968; or “competence,” Wojciszke et al., 1998) and the intent that underlies their actions (referred to as “sociability” or “morality”). In the interpersonal domain, “warmth” is frequently used to metaphorically represent sociability. Consequently, people described as warm are perceived to be more generous (Asch, 1946) and even incidental cues of warmth such as the sensation of warmth emitted from a hot coffee cup can lead to global evaluations of positivity in interpersonal contexts (Williams & Bargh, 2008; Ijzerman & Semin, 2009).

While temperature connotations are of little relevance when evaluating products that are not intended to be a specific temperature, they should assume special importance when thinking about other agents. Thus, if anthropomorphic primes lead people to attend to socially relevant information, than products with metaphorically warm connotations should be preferred over products with metaphorically cold connotations. We test this prediction by manipulating the accessibility of anthropomorphic concepts and examining whether anthropomorphic thoughts lead people to feel especially loyal toward products with metaphorically warm connotations.

Method

Participants ($N = 127$) completed the study online for partial course credit; they were randomly assigned to the conditions of a 2 (color label: warm vs. cold) x 3 (prime: anthropomorphism, object and a no prime control) factorial between-participants design.

To manipulate the warm or cold connotations of the car, participants were asked to select the color that most closely resembled their own car’s color from a matrix of nine

colored squares. The five most common car colors (accounting for 90% of all new car sales; Dupont, 2006) were labeled with “warm” (e.g., “summer blue”) or “cold” (e.g., “blizzard blue”) names. All participants saw a mixture of “warm” and “cold” color names along with four foil colors (e.g., “canary yellow”) and had to remember the name of their own car’s color as part of an alleged memory task. Note that this procedure ensured that all participants were exposed to a mix of warm and cold color names, thus avoiding the problem that some participants would only be exposed to warm and others only to cold concepts; instead, the conditions merely differ in whether the color of the participant’s own car is associated with a warm or cold label. This procedure randomly assigned 58 participants to the warm and 64 participants to the cold condition; 5 participants who forgot the color name associated with their car were dropped from analysis.²

Next, participants were randomly assigned to either complete a questionnaire measuring their cars physical or psychological traits using the thought manipulations used in Chapter Six. Subsequently, they described their car in their own words, indicated their desire to replace their car before they left college (1 = *not at all*; 7 = *very much*), and reported the name assigned to the color of their car (thus completing the memory task).

Results

Manipulation check.

Participants’ descriptions of their cars were again coded for the presence of anthropomorphic language by two independent coders. Agreement between coders about the presence of anthropomorphic language was excellent, $\kappa = .86$ (Fliess, 1981). A chi-square analysis revealed that participants in the anthropomorphism condition were more

likely describe their car in anthropomorphic language (24%) than participants in either the object (7%) or the control condition (6%), $\chi^2(2,162) = 10.82, p < .01$. The object and control conditions did not differ. This confirms that the manipulation worked as intended.

Participants' open ended descriptions of their cars were coded for valence by two coders blind to conditions and hypotheses (intraclass correlation = .89, $p < .001$); the coders' ratings were averaged to create a composite measure of perceived product quality (-3 = *extremely negative description*; +3 = *extremely positive description*). Analyses of this index of perceived product quality revealed no influence of the experimental manipulations (all $ps > .3$).

Hypotheses tests.

Replicating Study 1, a planned contrast (Rosenthal et al., 2000) comparing the anthropomorphism condition to the other two conditions confirmed that participants reported less intention to replace their car after rating its personality characteristics (anthropomorphism condition, $M = 2.83, SD = 1.54$) than after rating its technical characteristics (object condition, $M = 3.84, SD = 2.24$) or providing no attribute rating (control condition, $M = 3.82, SD = 2.04$), $F(1, 118) = 6.15, p < .05, \eta_p^2 = .05$. Follow-up contrasts revealed that the anthropomorphism condition differed from the object condition, $F(1, 118) = 5.08, p < .05$, as well as the control condition, $F(1, 118) = 4.15, p < .05$, whereas the latter two conditions did not, $F < 1$.

Next we turn to the influence of description valence and temperature prime. Replacement intentions were regressed on description valence, the warm/cold manipulation and a contrast code comparing the anthropomorphism condition with the

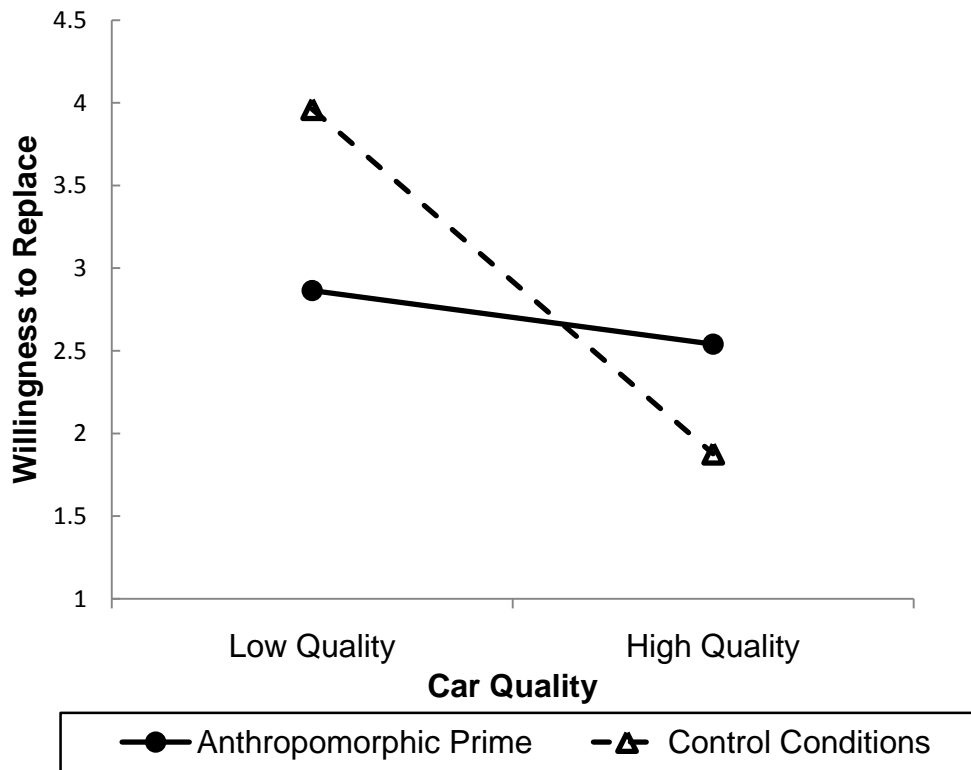
object and control conditions. Overall, participants who described their car negatively were more willing to replace it, $\beta = -.47$, $t(115) = 4.84$, $p < .001$. Moreover, participants assigned to the anthropomorphism condition reported lower replacement intentions than participant assigned to the object or control conditions, as reflected in a main effect of the dummy variable representing the anthropomorphism condition, $\beta = -.22$, $t(115) = 2.65$, $p < .01$. However, these main effects were qualified by two interactions. Replicating Study 1, an interaction between the anthropomorphism condition and perceived product quality again indicates that anthropomorphic thought dissociates replacement intentions from perceived product quality, as shown in Figure 5, $\beta = .22$, $t(115) = 2.34$, $p < .03$. As in Study 1, participants in the control, $r(34) = -.59$, $p < .001$, and object condition, $r(45) = .41$, $p < .001$, reported higher replacement intentions the more negatively they described their cars, whereas the two variables were unrelated in the anthropomorphism condition, $r(40) = -.07$, *ns*.

Going beyond the replication of Study 1, an interaction of the two experimental manipulations was also observed, $\beta = -.21$, $t(115) = 2.12$, $p < .04$ (Figure 6). An examination of simple slopes revealed that, as predicted, participants were particularly unwilling to replace anthropomorphized cars when their color had been associated with a warm ($M = 2.23$, $SD = 1.77$) rather than cold ($M = 3.48$, $SD = 2.10$) color label, $t(115) = 1.90$, $p < .05$, one-tailed, for the simple effect. In contrast, color labels did not influence participants' replacement willingness in the object ($M_{warm} = 4.00$, $SD = 2.44$ and $M_{cold} = 3.72$, $SD = 1.86$) and control conditions ($M_{warm} = 4.17$, $SD = 2.14$ and $M_{cold} = 3.44$, $SD = 2.22$), $t < 1$.

Discussion

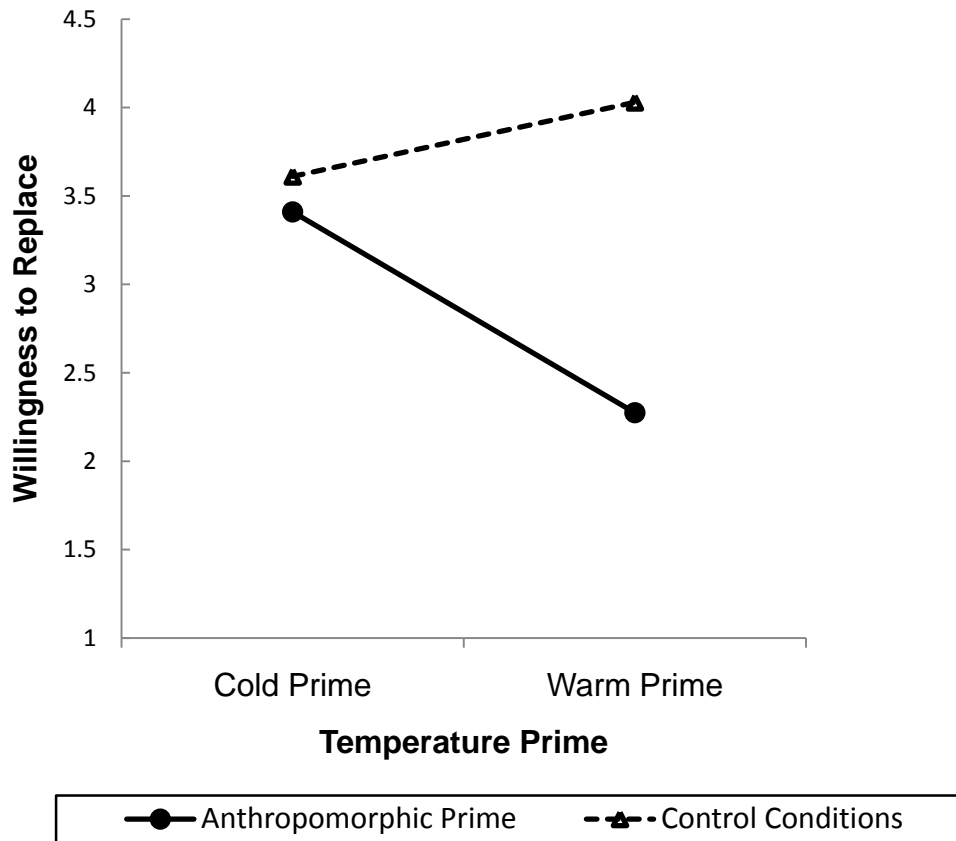
Replicating the studies reported in Chapters Five and Six, participants (i) reported a lower willingness to replace their car when they had thought about it in anthropomorphic terms and (ii) their replacement intention was decoupled from their perception of the car's quality, as measured by the valence of participant's descriptions of their cars. Extending these findings, participants who had thought about their car in anthropomorphic terms were (iii) particularly unwilling to replace it when they were led to perceive its color as "warm", a highly valued trait in the interpersonal domain. In contrast, warm/cold connotations of the car's color did not affect the replacement intentions reported by participants in the non-anthropomorphic thought conditions. This provides further support for the claim that people attend to socially relevant features of anthropomorphized objects by disentangling the accessibility of anthropomorphic concepts from the presence of socially relevant features.

Figure 5: Influence of product quality on replacement intentions in Chapter 7



The relationship between description valence and people's willingness to replace their vehicle before they leave college. Participants in the anthropomorphism condition filled out a personality questionnaire for their car. Control conditions either rated their car on non-anthropomorphic traits or did not rate their car. Description valence was evaluated by coding participants' descriptions of their cars. Low and high values are plotted one standard deviation below and above the mean.

Figure 6: Influence of temperature connotations on replacement intentions.



The relationship between temperature prime and people's willingness to replace their car before they leave college. Participants in the anthropomorphism condition filled out a personality questionnaire for their car. Control conditions either rated their car on non-anthropomorphic traits or did not rate their car. Cold and warm prime refers to the metaphorical connotations of a color label applied to the participant's car.

Chapter 8

Attachment and Replacement Intentions

If thinking about the psychological features of an object leads people to anthropomorphize it, then individual differences relevant to interpersonal relationships should influence how people think and feel about them. In particular, consumers' treatment of anthropomorphized products may be influenced by their attachment style. Attachment style can be thought of as the collection of social scripts that outline appropriate behaviors toward and likely responses from specific relationship partners as well as abstract representations of social interactions in general (for a review see Pietromonaco & Barrett, 2000). Attachment style influences interpretations of both the ambiguous behavior of familiar others (Baldwin et al., 1993) and early impressions of strangers (Eastwick & Finkel, 2008) and the perceivers resulting emotional response. Although people can have multiple attachment styles that reflect their unique history with different individuals (Baldwin et al., 1996), people typically have a general attachment style that is formed early in childhood (Bowlby, 1969) and remains stable over time and across adult relationships (Tidwell, Reis & Shaver, 1996).

Overview of attachment styles

Initial research on infant-parent attachment identified three primary attachment “styles” - secure, anxious and avoidant (Bowlby, 1982). Infant attachment style is

classified primarily by the concern the infant displays when their caregiver is absent and their response to caregivers upon their return. Research on adult attachment was inspired by this research but uses a somewhat different taxonomy that emerged through the use of self-report measures rather than behavioral observation. Adult attachment researchers situate attachment styles on a two-dimensional plane. One dimension is the degree of negativity one feels about themselves (“anxiety,” or more accurately the perceived likelihood of rejection by others) and is correlated with self-esteem. The other dimension expressing the degree of negativity one feels about others (“avoidance”) and corresponds roughly to sociability; Bartholomew & Horowitz, 1991).

The four quadrants of these intersecting planes represent attachment tendencies that map roughly onto the three attachment styles first identified by infant attachment researchers. Most people enjoy the company others but have little fear of rejection or abandonment and are considered securely attached (Bartholomew & Horowitz, 1991). Adults who desire social contact but fear rejection are considered “preoccupied” and correspond roughly to “anxious” attachment in infant research. The self-report methodology makes it possible for researchers to divide the infant category of “avoidant” into two subtypes depending on individuals’ motives for avoiding others. Adults who feel positively about themselves but remain aloof from others are “dismissive.” In contrast, adults who are so concerned about rejection by others that social contact is aversive are considered “fearful.” The dimensions of anxiety and avoidance are orthogonal and the influence of both can be examined simultaneously. This particular experiment focuses on the influence of anxious attachment and thus I turn to the influence of anxious attachment patterns on relationships in more detail.

Influence of anxious attachment styles on interpersonal relationships

People who are preoccupied or fearful are chronically concerned that others will reject them. Consequently, these individuals report feeling more negative affect following the dissolution of a relationship (Fraley, Davis & Shaver, 1997) or even when separated from their partners for a few days (Diamond, Hicks & Otter-Henderson, 2008). As a physiological marker of this response, anxious individuals also show more HPA axis activation (cortisol response) when separated from close others than non-anxious individuals (Powers, Pietromonaco, Gunlicks & Sayer, 2006).

In order to alleviate these feelings of distress, people who have anxious attachment orientations try to engage in behaviors that affirm the strength of the relationship. For example, in a naturalistic study Fraley and Shaver (1998) found that anxious/fearful individuals saying goodbye to loved ones at an airport were more likely to touch, hold on to, or follow their close other. Likewise, when close others are absent, anxious/fearful individuals are more likely to try and initiate telephone contact (Diamond et al., 2008). The desire to preserve relationships can persist even when the relationship is of poor quality. As a result, anxiously attached individuals are more likely to resume dissolved romantic relationships (Kirkpatrick & Hazan, 1994) and remain in abusive relationships (Henderson, Bartholomew, Trinke & Kwong, 2005). From this it may follow that just as people with anxious attachment styles are unwilling to replace other people, so too may they be unwilling to replace anthropomorphized objects.

Attachment to Objects

As discussed earlier, consumer psychologists note that consumers can become “attached” to products and brands (Ball & Tasaki, 1994; Schultz et al., 1991; Thompson

et al., 2005). In consumer research this refers to a unidimensional feeling of personal emotional connectedness. Since this represents positive feelings about a target it corresponds roughly to the avoidance dimension of interpersonal attachment. Concerns about rejection (“anxiety”) are typically irrelevant when interacting with inanimate objects. Thus although object “attachment” in consumer research clearly draws on the metaphor of interpersonal attachment, it is a simpler construct that does not require much beyond an evaluation of the object on the part of perceivers.

There is some evidence that suggests that people treat objects in a way that more closely resemble a relationship, for example by using interpersonal emotions such as “love” to describe them (Schultz et al., 1991). This is particularly apparent among children, who sometimes acquire “transitional” objects (Winnicott 1953) that become a surrogate for a caregiver. Supporting this claim, research has shown that children with transitional objects are more likely to touch or hold the object - such as a blanket or a stuffed animal - when in mildly stressful situations (Triebenbacher & Tegano, 1993), mirroring the comfort seeking behavior typical to an attachment relationship. Likewise, during stressful situations such as a visit to a doctor’s office, the presence of transitional objects is as comforting as the presence of a caregiver (Ybarra, Passman & Eisenberg, 2000). These findings suggest that at a minimum, objects can assume part of the functional role of attachment figures among children.

While objects can act as surrogate attachment figures, researchers examining whether people’s attachment style influences whether they develop relationships with objects have generally found more mixed evidence. Securely attached children are more likely to acquire a transitional object (Steir & Brauch, 2000; Lehman, Denham, Moser &

Reeves, 1992; but see also Passman, 1987). However, one study found that although high levels of anxiety did not make children particularly likely to acquire transitional objects, anxious children may retain transitional objects for longer than developmentally appropriate (Bachar et al., 1998). Likewise, among adults, researchers have shown that people with anxious attachment styles more readily form parasocial bonds with television characters (Cole & Leets, 1999) and religious entities (Kirkpatrick & Shaver, 1990).

There are two possible explanations of these findings. Drawing from research on adults, some researchers predict that attachment style may influence the likelihood of perceiving agency in inanimate objects (Epley et al., 2007). This account assumes that anxiously attached individuals are chronically motivated to seek out relationships with others. As a result, they are predicted to be sensitive to the presence of agentic cues and thus may readily anthropomorphize objects. This claim is further supported by studies that demonstrate that loneliness (which is assumed to correlate with an anxious attachment) increases the perception of agency in nonliving objects (Epley, Akalis, Waytz & Cacioppo, 2008; but see also Rubin, Perse & Powell, 1985). This account does not, however, provide a compelling explanation for why securely attached children acquire transitional objects earlier than others, forcing one to assume that a third variable that is negatively correlated with attachment anxiety contributes to the early acquisition of transitional objects.

An alternative interpretation is that people's attachment styles do not influence whether they anthropomorphize an object, but instead influence how they treat anthropomorphized objects. This perspective could reconcile the apparent conflict between research demonstrating that securely attached young children are more likely to

possess transitional objects while anxiously attached adolescents and adults are more likely to engage in relationships with objects. People with secure attachments have less difficulty establishing relationships with others, and so too do they acquire transitional objects more readily (Steir & Brauch, 2000; Lehman, et al., 1992). In contrast, individuals with anxious attachment patterns hold onto and invest in relationships, even if they are of poor quality, and so too do they hold on to transitional objects for longer than appropriate (Bachar et al., 1998) and invest themselves in targets that cannot reciprocate (Cole & Leets, 1999). Thus attachment patterns may influence how people establish and maintain relationships with objects rather than their overall desire for them.

Based on these accounts, the purpose of this experiment is to test the general prediction that people with anxious attachment styles (“preoccupied” and “fearful”) are reluctant to replace anthropomorphized objects. Both of these accounts agree that anxious attachment should predict greater reluctance to replace anthropomorphized objects, albeit for two different reasons. On one hand, as predicted by models of agent detection (Epley et al., 2007), an anxious attachment style may make people more sensitive to the presence of anthropomorphic primes and all people who anthropomorphize objects are equally reluctant to replace them. On the other hand, as predicted by research on interpersonal relationships, an anxious attachment style should not influence the perception of agency but may influence how people treat objects once they are classified as agents.

To address these two mechanisms, I also examine the relationship between attachment style and the use of anthropomorphic concepts in participants’ descriptions of their possessions. If anxious attachment increases the likelihood of perceiving agency then people with anxious attachment styles should use more anthropomorphic language.

If, on the other hand, anxious attachment changes how people relate to anthropomorphized object, then attachment style should influence replacement intentions without influencing the use of anthropomorphic language.

Method

Participants ($N = 150$) completed the study online for partial course credit; they were randomly assigned to either think of the psychological features of their computer (anthropomorphism condition) or the physical features of their computer (object condition). Next, participants described their computer in their own words and indicated their desire to replace it before they left college (1 = *not at all*; 7 = *very much*).

Participant attachment style was measured as a part of an earlier prescreening questionnaire. Participants rated the extent to which descriptions of each of the four adult attachment styles were descriptive of their own feelings about relationships (adopted from Bartholomew and Horowitz, 1991). A score representing the degree of anxiety were calculated by taking the difference between endorsement of high anxiety attachment styles (“preoccupied” and “fearful”) and low anxiety attachment styles (“secure” and “avoidant”). A score representing the degree of avoidance was calculated by taking the difference between endorsement of high avoidance items (“fearful” and “avoidant”) and low avoidance items (“secure” and “preoccupied”), allowing individual differences in both dimensions of attachment orientation be examined. These scores were not significantly correlated with each other, $r(148) = .14, p < .10$.

Results

Manipulation checks.

Participants' descriptions of their computers were again coded for the presence of anthropomorphic language by two coders. Agreement between coders about the presence of anthropomorphic language was good, $\kappa = .74$ (Fliess, 1981). A chi-square analysis revealed that participants in the anthropomorphism condition were more likely describe their computer in anthropomorphic language (32%) than participants in the object condition (5%) Fisher's exact, $p < .001$. This confirms that the manipulation worked as intended.

Participants' open-ended descriptions of their cars were coded for valence by two coders blind to conditions and hypotheses ($\alpha = .90$); the coders' ratings were averaged to create a composite measure of perceived product quality ($-3 = \textit{extremely negative description}$; $+3 = \textit{extremely positive description}$). Analyses of this index of perceived product quality revealed that contrary to earlier studies, people in the anthropomorphism condition described their computers more positively ($M = 1.09, SD = 1.37$) than in the object condition ($M = .51, SD = 1.11$), $F(1, 137) = 7.78, p < .01, \eta_p^2 = .05$.

Hypothesis Tests.

As discussed earlier, attachment style may influence how sensitive people are to the presence of other agents. To test whether this is the case, condition (dummy coded), anxiety, avoidance and the interaction between each attachment dimension and condition were regressed on the presence of anthropomorphic language, revealing the expected main effect of condition, $\beta = 10.83, Wald = 12.22, p < .001$. However, this finding was

qualified by an interaction between condition and anxiety, such that more anxious individuals were marginally more likely to use anthropomorphic language in the anthropomorphism condition, $\beta = 1.31$, Wald = 3.37, $p < .07$.

In order to explore this finding further, anthropomorphic language was recoded into the spontaneous use of anthropomorphic descriptions of objects (e.g. personality traits and personal pronouns) and the expression interpersonal emotions (i.e. love) to describe feelings toward the object. Each of these subcategories was examined using the analytic strategy described above. Anthropomorphic cognitions were more likely in the anthropomorphism condition, $\beta = 10.73$, Wald = 7.22, $p < .01$ but were uninfluenced by attachment style, Wald < 1, ns, indicating that anxiously attached individuals were no more likely to attribute anthropomorphic traits to their computers.

Turning to the expression of interpersonal emotion, the same analysis revealed a marginal main effect of the anthropomorphism condition, $\beta = 17.42$, Wald = 3.65, $p < .06$. However, in contrast to the use of anthropomorphic descriptions, for interpersonal emotion there was also a marginal main effect of anxiety, $\beta = 0.70$, Wald = 3.60, $p = .06$, qualified by an interaction between anxiety and condition, $\beta = 1.70$, Wald = 6.07, $p < .02$ indicating that people who are high in anxiety are especially likely to spontaneously use interpersonal emotion words when describing anthropomorphized computers (Figure 7).

By considering the use of anthropomorphic descriptions and emotional responses separately, it seems less likely that people with anxious attachment styles are more sensitive to anthropomorphic cues. They are no more likely to use anthropomorphic descriptions when referring to their computers. However, they seem to be more likely to

report experiencing feeling love for their anthropomorphized objects. One possible explanation for their frequent use of the word “love” is that anxiously attached individuals simply feel more positively towards anthropomorphized objects. To rule out this possibility, condition, anxiety, avoidance and the interactions between each attachment dimension and condition were regressed on coder’s evaluations of subjects’ descriptions of computer quality. Other than the main effect of condition reported earlier, there were no other main effects or interactions. Of particular note, people with more anxious attachment styles were no more positive in their description of their computers in the anthropomorphic condition than people with less anxious attachment styles, $t < 1$ for the interaction. Thus, although anxiously attached people are more likely to say that they feel love towards their computer following an anthropomorphic prime, the overall positivity of their descriptions did not mirror this pattern.

Finally, replacement intentions were examined using a similar analytic strategy. Condition, anxiety, avoidance and the interaction between each attachment style and condition were regressed on replacement intentions. Computer quality was also included as a covariate to eliminate its confounding influence on replacement intentions. Participants assigned to the anthropomorphism condition reported marginally lower replacement intentions than participants assigned to the Object condition, as reflected in a main effect of the dummy variable representing the anthropomorphism condition, $\beta = -.16$, $t(134) = 1.78$, $p < .08$. There was also a marginal main effect of anxiety, $\beta = .221$, $t(134) = 1.88$, $p = .06$. However, these effects were qualified by an interaction between anxiety and condition, $\beta = -.334$, $t(134) = 2.80$, $p = .01$.

An examination of simple slopes that explored this interaction revealed that condition had no effect on participants who scored one standard deviation below average in anxiety, $t(134) < 1$. In contrast, participants who scored one standard higher than normal on anxiety were less willing to replace their computer in the anthropomorphism condition ($M = 3.26, SD = .50$) than in the object condition ($M = 4.68, SD = .59$), $t(134) = 2.83, p < .01$. Put differently, in the object condition, anxiety was modestly associated with an *increased* willingness to replace their computers, $r(77) = .21, p < .06$, while in the anthropomorphism condition, anxiety was associated with a *decreased* willingness to replace their computers, $r(70) = -.29, p < .05$ (Figure 8). Taken together, this suggests people with anxious attachment styles are particularly unwilling to replace anthropomorphized objects.

Discussion

Replicating the studies reported in Chapters Five through Seven, participants reported a somewhat lower willingness to replace their computers when they had thought about them in anthropomorphic terms, even after controlling for differences in the positivity they felt towards anthropomorphized and non-anthropomorphized objects. Extending these findings, participants who had anxious attachment patterns were particularly unwilling to replace objects when they thought of them in anthropomorphic terms suggesting that interpersonal attachment style influences how consumers treat anthropomorphized products.

Additionally, anxious attachment patterns did not predict the use of anthropomorphic descriptions of objects. This seems to suggest that people with anxious

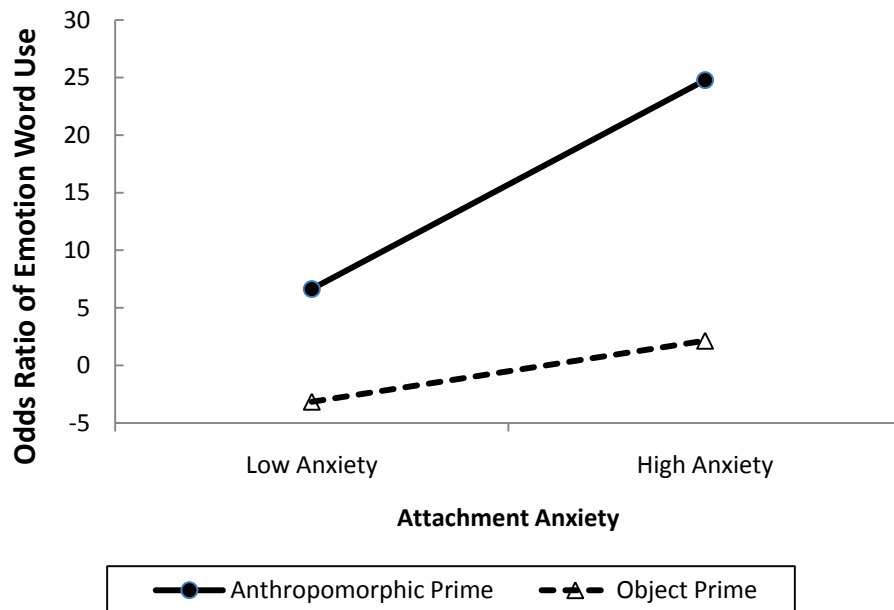
attachment styles are not necessarily more likely to perceive agency in their environment as predicted by other researchers (Epley et al, 2007). However, people with anxious attachment styles were more likely to spontaneously mention interpersonal emotions (i.e. love) when describing their objects. Interestingly, anxiously attached people's descriptions of their computers were not more positive overall. Low anxiety individuals provided positive descriptions of their computers without expressing love, while some anxious individuals freely admitted the flaws of an object, before professing that they "love it anyway."

This finding does not lead unambiguous support for either explanation of why anxiously attached individuals are reluctant to replace their possessions. One interpretation is that although drawing attention to the "psychological" features of an object does not lead people with anxious attachment styles to perceive their possessions in anthropomorphic terms it does lead them to reconstitute "ownership" of objects as a "relationship." However, it is also possible that the anxious individuals are more sensitive to anthropomorphic primes but are also more likely to attend to their relationship with others. As a result, in the limited space provided they may choose to emphasize these feelings at the expense of elaborating on its psychological features. . A third possibility is that the anthropomorphic prime is equally likely to make anxious and non-anxious individuals think about objects in relational terms, but that this evokes a particularly strong emotional response from anxious individuals leading them to express feelings of love.

This ambiguity highlights the limitations of using indirect methods to assess the accessibility of relational thoughts and feelings. In the relatively short descriptions

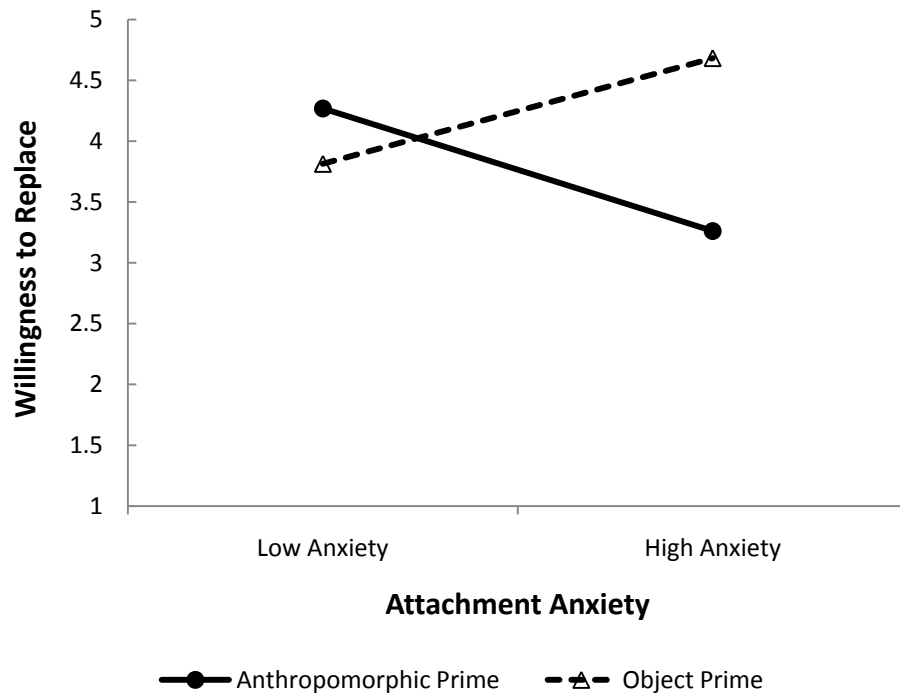
participants provided, the expression of interpersonal feelings was nearly perfectly correlated with the use of interpersonal thoughts. Future studies could fruitfully address this issue by examining whether people with anxious attachment styles are more likely to adhere to relational norms that do not require feelings of love. For example, the former explanation would predict that anxious individuals would obey communal or exchange norms when interacting with an object depending on which rule were contextually appropriate. The latter explanation would predict that people would predict that anxiously attached individuals would expect communal norms and feel rejected when these norms were violated.

Figure 7: Relationship between attachment anxiety and use of interpersonal emotion words



The relationship between attachment style and the odds ratio of participants' expression of interpersonal emotions when describing their computer. Values on the Y-axis are odds-ratios relative to average participants in the control condition. Participants in the anthropomorphism condition filled out a personality questionnaire for their computer. Participants in the object condition rated their computer on non-anthropomorphic traits. Attachment anxiety was by evaluated at prescreening. Low and high values are plotted one standard deviation below and above the mean.

Figure 8: Relationship between attachment anxiety and replacement intentions



The relationship between attachment style and people's willingness to replace their computer. Participants in the anthropomorphism condition filled out a personality questionnaire for their computer. Participants in the object condition rated their computer on non-anthropomorphic traits. Attachment anxiety was by evaluated at prescreening. Low and high values are plotted one standard deviation below and above the mean.

Chapter 9

Anthropomorphism and Emotional Response

As suggested by Chapter 8, anthropomorphizing objects could lead to the experience of interpersonal emotions when thinking about them. This observation is supported by appraisal theories of emotion, which hold that emotional responses to situations are dictated by the combination of evaluations of the causes and outcomes of events. Appraisals of valence account for the majority of variance when predicting emotional response (Smith & Ellsworth, 1985), reflecting that people almost always feel positive emotions in response to desired events and negative emotions in response to undesired events. However, other appraisals, including who was affected by the action, the level of certainty about the cause or outcome and the intentionality of the act (and thus, by implication, the presence of an agent) help differentiate affective experiences into discrete emotions.

Positive emotions are not the best candidates to evaluate this hypothesis. Research on the relationship between appraisal dimensions and specific emotional responses has found that in general positive emotions tend to be diffuse and undifferentiated (Ellsworth & Smith, 1988a). Returning to the example of love, although in the strictest sense it is an

interpersonal emotion, it is often used interchangeably with other positive emotions. In contrast, negative emotions tend to be more discrete. Thus, while it would be acceptable to profess “love” for a rainbow, it would be somewhat odd to express anger at a rain cloud. Appraisals show a similar pattern, tending to have a more complex and differentiated structure for negative rather than positive emotions (Smith & Ellsworth, 1985). This differentiation reflects the role of negative feelings as adaptive “problem signals” that motivate an organism’s response (Schwarz, 2010; Nesse, 1990) and suggests that negative emotions might provide a more convincing test of the role of anthropomorphic cues on emotional response.

Although emotional experience is influenced by many different appraisal dimensions, appraisals of agency assume central importance in the discrimination between core negative emotions. In general, people feel guilty when they are the source of harm, angry when others are the source of harm and sad when events are not caused by any apparent agent as reflected by the appraisal patterns given by participants asked to recall events that elicited a particular emotion (Smith & Ellsworth, 1985). Other researchers using similar methods have reached generally the same conclusion, identifying perceptions of unfairness as an appraisal central to the experience of anger (Roseman, Weist & Swartz, 1994; Roseman, 1984). Unfairness is often implied in intentional harmful acts and unsurprisingly these “dimensions” are correlated quite highly (Ellsworth & Smith, 1988b) suggesting that these reflect a common underlying construct.

Converging evidence for the relationship between other-caused harm and anger comes from experiments that manipulate appraisal dimensions and investigate the subsequent effect on emotional response. Ellsworth and Smith (1988b) asked participants

to recall events that matched specific patterns of appraisal. They then asked participants to describe the event before measuring the specific appraisals they made about the situation (effectively a manipulation check) and the emotions they felt. They found that people reported feeling more anger and less guilt in response to negative events caused by others as compared to negative events caused by the self and more sadness when the negative outcome was a result of the situation rather than a specific human agent (see also Smith, Haynes, Lazarus & Pope, 1993; Neumann, 2000). Although most real life experiences elicit complex blends of emotional response with few one to one associations between specific appraisal patterns and specific emotions, diary studies have shown that the relationships between appraisal patterns and emotions observed in the laboratory remain stronger than relationships between theoretically unrelated constructs (Nezlek, Vansteelandt, VanMechelen & Kuppens, 2008; Goetz, Frenzel, Stoeger & Hall, 2010).

Together these findings suggest that to the extent that anthropomorphic cues create the possibility that an object's "actions" are intentional, they should also intensify the experience of emotions that are related to appraisals of other-agency when thinking about it. To test this, participants were primed to think of their vehicle in terms of either its psychological or physical characteristics. Following this induction, participants were asked to recall a time their vehicle failed them. It was predicted that priming agentic thoughts should lead people to perceive relatively more intent behind negative events and consequently experience more anger.

Method

135 participants were recruited from Mechanical Turk to complete the survey. Three dropped out and three did not agree to answer questions carefully and take the

survey seriously, leaving a total of 129. Participants were randomly assigned to one of three conditions (anthropomorphism, object, and control) and told that the survey explored “what people think about their cars.” Participants assigned to the anthropomorphism condition first rated their car on five bipolar scales anchored with personality traits (*reserved – enthusiastic, quarrelsome – sympathetic, dependable – irresponsible, open to new experiences – uncreative, and anxious – calm*), whereas participants assigned to the object condition rated physical attributes of their car (*quiet – loud, unresponsive – responsive, unreliable – reliable, versatile – limited, shaky – smooth*).

Participants were then asked to “think back to a time when something went wrong with your car. This could include something happening that was not supposed to happen or something not happening that was supposed to happen.” They were asked to picture this situation in their mind and describe in as much detail what went wrong and how the consequences affected them personally.

After describing the event participants reported their emotional response by indicating the extent to which they felt 12 different emotions (see Appendix). Although frustration is sometimes conceived of as distinct from anger, it typically highly related to anger (Smith & Ellsworth, 1985; Ellsworth & Smith, 1988b) and in the sample participants did not appear to differentiate between these emotions. Thus, frustration was collapsed into a single measure of anger along with the two adjectives designed to measure anger (angry and resentful; $\alpha = .75$). Participants also rated how they felt on 9

other adjectives (happy, relieved, surprised, interested, bored, guilty, afraid, sad and resigned).

Participants then answered a number of questions designed to measure their appraisals of the situation. They rated the extent to which they thought the situation was pleasant, certain, predictable and effortful. To measure appraisals of responsibility they also rated the extent to which they felt the situation was under their personal control, under the control of others, caused by others, beyond anyone's control and the extent to which they felt cheated or wronged (see Appendix; adapted from Smith & Ellsworth, 1985). In previous research the last four items formed a single dimension of human agency composed of two subfactors - the extent to which the self caused the outcome (self-control and personal responsibility) and the extent to which another agent caused the outcome (perceptions of other control and feelings of being cheated). In this particular study these subscales had poor reliability ($\alpha s < .5$) so they will be treated individually in subsequent analysis.

Results

Emotion.

The key prediction is that anthropomorphic primes should make people feel more anger, but not differ in their experience of other negative emotions. A planned contrast (Rosenthal, et al. 2000) with negative emotions as within-subjects factors (weights: anger 4, sad -1, resigned -1, afraid -1 and guilty -1) and condition as a between-subjects factor was significant, $F(1,118) = 4.94, p < .03, \eta_p^2 = .04$.

A planned contrast examining the influence of the anthropomorphic prime on anger confirmed that participants reported feeling more anger when thinking of a time their car malfunctioned after rating its personality characteristic ($M = 5.29, SD = 1.63$) than after rating its technical characteristics ($M = 4.46, SD = 1.90$) or in the control condition ($M = 3.93, SD = 2.12$), $F(1,120) = 10.71, p < .001, \eta_p^2 = .08$. In contrast, other negative emotions were unaffected, $F_s < 1$.

Appraisals.

Participants reported that their vehicle's malfunction was less pleasant after rating its personality characteristics ($M = 1.64, SD = .89$) than after rating its physical characteristics ($M = 2.29, SD = 1.38$) or in the control condition ($M = 1.98, SD = 1.30$), $F(1,120) = 4.75, p < .04, \eta_p^2 = .04$. Participants also felt somewhat more "cheated or wronged" after thinking about their vehicle in anthropomorphic terms ($M = 3.54, SD = 2.05$) than after thinking about their vehicle in technical terms ($M = 2.85, SD = 1.84$) or in the control condition ($M = 2.73, SD = 2.03$), $F(1,120) = 3.57, p < .05, \eta_p^2 = .03$. Finally, people felt a greater sense of responsibility for the malfunction after thinking about either technical ($M = 2.74, SD = 2.27$) or anthropomorphic ($M = 3.09, SD = 1.89$) features of their car felt a greater sense of responsibility for the malfunction than those in the control group ($M = 2.02, SD = 1.40$), $F(1,119) = 4.00, p < .05, \eta_p^2 = .03$, suggesting that perhaps problems seem more obvious in hindsight following consideration of features that could contribute to it.

Mediational Analysis.

Priming consumers to think about their vehicle in anthropomorphic terms exerts a direct effect on both feelings of anger and perceptions of being cheated. A mediational

analysis using bootstrapping (Preacher & Hayes, 2008) revealed that the perception of being cheated was also related to feelings of anger, $t(121) = 5.81, p < .001$. Furthermore, the indirect effect of anthropomorphic beliefs through perceptions of being cheated was significantly different from zero, with a point estimate of .26, and a 95% BCa (bias-corrected and accelerated; see Efron, 1987) bootstrap confidence interval of .028 to .570 indicating that the indirect effect was significantly different from zero. However, the direct effect of the anthropomorphic prime on feelings of anger remained significant, $t(121) = 2.61, p = .01$ indicating that mediation was only partial (Figure 9)

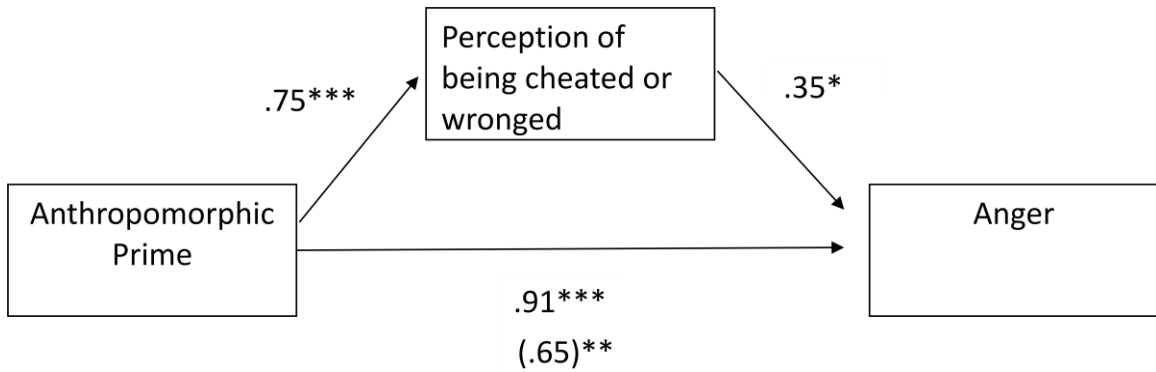
Discussion

In line with predictions, thinking of a vehicle's psychological features led participants to report feeling more anger after recalling a time when it failed them. Direct support for the appraisal process that predicted this outcome was somewhat more limited. The items designed to measure appraisals of other-agency had quite low reliability. However, feelings of being cheated or wronged partially mediated the influence of anthropomorphic beliefs on feelings of anger.

One possible reason why feelings of being cheated differed by condition but appraisals of other-agency did not is that being "cheated" captures both other-causality and a perception of unfairness and may thus be closer to the core of appraisals related to anger (Roseman et al., 1994). However, this is unlikely as it does not explain why feelings of being cheated and other-agency are poorly correlated in this study but not in earlier research (Smith & Ellsworth, 1985; Ellsworth & Smith, 1988b).

A more plausible explanation is that the perception of being cheated is a somewhat less direct measurement of intentionality that itself relies on a global feeling. In contrast, determining explicit other-causality requires a more careful and deliberate analysis of what happened. Although appraisals are assumed to be antecedent to emotional experience (Ellsworth, 1991; Schwarz, 2010), emotions can also evolve over time and initial appraisals can be modified by subsequent deliberative thought (for a discussion see Frijda, 1993). One characteristic that distinguishes deliberative thought from relatively automatic processes such as those assumed to occur in early stages of appraisal is that they can be rejected as false (Bodenhausen & Gawronski, 2006). To the extent that answering an explicit question about causality requires deliberative thought, it may provide an opportunity for people to revise their initial reactions. This could explain why the anthropomorphic prime affected the somewhat more intuitive perception of being cheated but not more direct appraisals of other-causality while also accounting for the relatively poor correlation between these questions.

Figure 9: Direct and indirect effects of anthropomorphic thoughts on feelings of anger



Path values represent unstandardized regression coefficients. The values outside of the parentheses represent the direct effect of a variable without mediators. Value in parentheses represents the direct effect, from bootstrapping analyses, of anthropomorphism on feelings of anger after the mediators are included. * $p < .05$. ** $p < .01$, *** $p < .001$.

Chapter 10

Conclusion

Taken together, these findings show that attending to “psychological” features of a product alters people’s thoughts and feelings about objects. This (i) decouples interest in purchasing or retaining a product from instrumental considerations about the product. Consumers typically desire products that they have a use for, but for products that possess anthropomorphic cues desire is not predicted by need (Chapter Four). Likewise, when thinking about products that they already own, people’s replacement intentions depended on the perceived quality of the product but this relationship vanished when anthropomorphic beliefs were primed (Chapters Five, Six and Seven).

Instead, thinking about the “psychological” features of a product (ii) leads people to attend to features that are valued in the interpersonal domain. People are more attracted to anthropomorphized products that have neonatal features (Chapter Four). Likewise, consumers who were induced to think of their car as “warm” reported lower replacement intentions than consumers who were induced to see it as “cold”, but only under anthropomorphic thought conditions (Chapter Seven). In combination, these findings suggest that anthropomorphic thought shifts the information that consumers attend from features relevant to object cognition to features relevant to social cognition.

Additionally, (iii) although people did not prefer new products with anthropomorphic features (Chapter Four) they are (iv) generally reluctant to replace anthropomorphized products that they already own (Chapters Five, Six and Seven), especially if (v) they have an anxious interpersonal attachment style (Chapter Eight). Finally, the frequency of spontaneous use of the word “love” by the anxiously attached participants in Chapter Eight suggests that (vi) interpersonally relevant emotions may drive people’s reluctance to replace objects although normative considerations may also play a role. This interpretation is supported by a more direct test of the downstream emotional consequences of anthropomorphism (Chapter Nine) that demonstrates that agency leads people to feel more anger when a product fails them. This finding is consistent with appraisal theories of emotion, which predict anger in response to harmful acts caused by another agent.

Note that these findings cannot be explained by assuming that the manipulation of anthropomorphic thought merely increased participants’ positive regard towards objects. We observed no consistent difference in the positivity of participants’ free-response descriptions of their cars. Some studies showed no effect of the anthropomorphic prime on overall positivity (Chapters Six and Seven) while in others, the influence of the anthropomorphic prime on replacement intentions occurs despite statistically controlling for overall positivity of descriptions on replacement intentions (Chapters Five and Eight).

Even if observed, any increase in positive regard would merely predict decreased replacement intentions. This account, however, falls short of accounting for four other key findings. First, it provides no rationale for the decoupling of replacement intentions and product utility. Second, it fails to predict the increased impact of attributes valued in

the interpersonal domain. Third, it fails to predict the influence of interpersonal attachment on replacement intentions for anthropomorphic objects. Fourth, it fails to predict that people would feel more anger when thinking about an anthropomorphized product that has failed them. In contrast, the assumption that anthropomorphic thought grounds object cognition in social cognition provides a parsimonious account of all findings.

Taken together these findings suggest that consumers do not automatically and consistently anthropomorphize non-living products (as implied by correlational research, e.g. Aaker 1997; Moon & Nass 1996) but rather that they are sensitive to agentic cues. Further, by holding the target of judgment constant and manipulating only whether its features are construed in “psychological” or “physical” terms, these findings demonstrate that the categories of “human” and “nonhuman” have fundamentally different consequences for information processing, yet the category in which a target of judgment is included is malleable and depends not only on features of the target and perceiver but additional contextual cues that influence category accessibility and applicability.

Implications

Anthropomorphizing products may have beneficial as well as adverse consequences for both consumers and companies. On the one hand, the increased attachment resulting from anthropomorphizing a product (say a car) may lead consumers to invest more in maintaining it. If so, consumers may benefit from an increased life-span of their possessions and businesses from the services and products required for proper maintenance. On the other hand, anthropomorphizing a product reduces consumers’

willingness to replace it, as seen in the present studies. This may potentially increase consumers' maintenance cost beyond economically defensible levels while reducing producers' sales.

Our findings further show that anthropomorphic cues can direct attention away from some features and towards others. This may allow marketers to increase the likelihood that desirable features are attended to, while decreasing the attention paid to undesirable features. But as previous research noted, this strategy may have consequences that are not always obvious. Anthropomorphic cues may turn an otherwise innocuous air intake grille into a welcoming smile or a threatening scowl or may allow an idiosyncratic collection of objects to become a family (Agarwal & McGill, 2007). Likewise, anthropomorphic cues may direct consumers' attention away from the physical quality of a product and towards other, less instrumental features, as observed in Study 2. This could hurt products of superior technical quality and benefit competitors with more appealing "interpersonal" features.

To the extent that anthropomorphic perceptions elicit corresponding relational expectations, consumers may also respond negatively when the product does not live up to them. For example, Agarwal (2004) found that people dislike products that imply a specific kind of interpersonal relationship style (e.g. a communal or exchange orientation) once they realize that the product does not live up to the norms associated with it. Similarly, anthropomorphic primes may make consumers feel angrier if an object cannot live up to its expectations.

Finally, the observation that anthropomorphic thought is easily elicited by asking for trait ratings raises a potentially important methodological concern for market research surveys. Stimulated by research into brand personality (Aaker, 1997), many applied market research surveys assess consumers' perceptions of a brand by asking for ratings that usually include a mix of anthropomorphic (e.g. "honest") and non-anthropomorphic (e.g. "rugged") traits. Our findings suggest that the anthropomorphic traits may foster anthropomorphized perceptions of the brand with downstream effects on intentions. If so, collecting ratings of agentic traits may introduce a previously unobserved source of systematic context effects in market research (Weaver & Schwarz, 2008), potentially undermining the predictive value of respondents' answers for consumers who were not first induced to think in anthropomorphic terms. Future research may fruitfully address this possibility.

Limitations and Future Directions

Although these studies improve upon previous research on anthropomorphism by adopting a method that allows the category a target belongs to be experimentally manipulated while its attributes are held constant and they identify novel effects of anthropomorphic primes, there are a number of limitations that future research could address. The method by which the accessibility of anthropomorphic thoughts is measured could be improved. Although the coding of free responses for the spontaneous use of anthropomorphic terms and positive feelings towards an object has its strengths – namely it provides a conservative test of anthropomorphic belief that is less susceptible to demand characteristics – it is a relatively coarse measure of these constructs. This is especially true for the accessibility of anthropomorphic terms, which is not only a

dichotomous measure but also may be influenced by normative or conversational conventions that inhibit the expression of anthropomorphic thought. Future research investigating whether these beliefs - and more specifically what kinds of agentic beliefs – influence different downstream decisions about objects could benefit from the use of more sensitive measurements.

Second, the extent to which these effects occur automatically or as the result of more deliberative processes remains an open question. Subtle primes have a somewhat greater influence on replacement intentions (Chapters Six and Seven) than more blatant primes (Chapter Four) and anthropomorphic cues influence a relatively indirect measure of other-agency (perceptions of being cheated) but not a direct attribution of other-agency (Chapter Nine). This is consistent with more general research on priming that finds that people will correct their judgments when they believe to have been subject to undue influence and have a theory about how to correct this bias (Martin, 1986; for recent reviews see Gawronski & Bodenhausen, 2006; Schwarz & Bless, 2010).

At the same time, at least *some* downstream consequences of anthropomorphic thought (e.g. detecting threatening agents) should be relatively automatic and thus unaffected by the negation of these primes. For example, other research has shown that even people who do not believe in ghosts behave more pro-socially when told a room is “haunted” (Bering McLeod & Shackleford, 2005). Future research could also explore whether social processes that are automatic are similarly influenced by anthropomorphic primes as these should be far easier to influence. Likewise, exploring the relationship between individual differences and the processing of anthropomorphic primes through

automatic or propositional pathways could also provide a clearer picture of who is affected by anthropomorphic primes under different circumstances.

Appendix

Materials used in Chapter Nine

To what extent do the following adjectives describe how you felt while you were actually experiencing the situation?

Happy

Not at all Very much so

Resentful

Not at all Very much so

Bored

Not at all Very much so

Relieved

Not at all Very much so

Angry

Not at all Very much so

Confident

Not at all Very much so

Surprised	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all							Very much so
Interested	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all							Very much so
Resigned	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all							Very much so
Hopeful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all							Very much so
Frustrated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all							Very much so
Guilty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all							Very much so
Sad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all							Very much so
Afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not at all							Very much so

The following questions are about how you interpreted the situation you just described. As you answer each question, think back to how you understood the situation.

How pleasant or unpleasant was it to be in this situation?

Very unpleasant Very pleasant

How well did you understand what was happening in the situation?

Not at all Extremely

How uncertain were you about what was happening in the situation?

Not at all Extremely

How well could you predict what was going to happen in this situation?

Not at all Extremely

In this situation, to what extent did you feel cheated or wronged?

Not at all Extremely

To what extent did you feel that circumstances beyond anyone's control were happening in the situation?

Not at all Extremely

To what extent did you feel that you had the ability to influence what was happening in this situation?

Not at all Extremely

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