1. Introduction

Among disgust researchers, the disgust-eliciting properties of animals are well known. The most influential research on the role of animals in causing disgust comes from Graham Davey and Paul Rozin, both of whom place animals at the center of the evolved functions of disgust. Rozin’s theory of disgust, which is arguably the most widely accepted over the last 25 years, places special emphasis on animals. As he and his colleagues claim in a well-known survey article, the evolved function of disgust is to protect us from seeing ourselves as “lowered, debased, and mortal” (Rozin, Haidt, & McCauley, 2008, p. 762). This includes being in the company of animals, because “anything that reminds us that we are animals elicits disgust” (p. 761).

The centrality of animals in eliciting disgust seems somewhat odd, given the prominence of animals in human lives. Disgust research indicates that we should avoid animals, but it’s not clear that we actually do. I propose that this presents an explanatory challenge for disgust researchers. There is a great deal of evidence to suggest that animals do indeed cause aversive and avoidant reactions in human beings. But animals and humans were in close contact long before domestication (Serpell, 1996), and it’s hard to imagine how anyone in contemporary societies could avoid animals entirely. Thus, we are faced with the challenge of explaining how human beings cope with the presence of animals, given their disgust-evoking powers.

This paper aims to provide such an explanation. In order to develop the explanatory challenge, I first attempt to provide a thoroughgoing account of how and why animals elicit disgust. I draw from Rozin’s theory of disgust, as well as Kelly (2011), to argue that animals...
elicit disgust in two ways. One is by triggering disease-protection mechanisms, and the other is by eliciting what is called mortality salience, or thoughts of death (as indicated in Rozin’s comments above). I discuss how these two types of disgust operate and defend their conceptual and theoretical coherence against common objections.

I then attempt to provide a solution to the explanatory challenge by utilizing research by Nick Haslam (2006; Haslam & Loughnan, 2014) on infrahumanization and dehumanization. I argue that this research suggests that we cope with animals, despite their disgust-evoking powers, by attributing them mental states that include positive evaluations but simultaneously “mark” animals as inferior beings. This is proposed as a hypothesis for further exploration by researchers working on the psychology and biology of disgust.

2. Animals as Disgust Elicitors

2.1 Core Disgust

I will begin by outlining animals’ role in what is known as core disgust. Core disgust is so named because it is hypothesized to represent the evolutionary functional core of disgust. This is a natural starting point for providing an account of disgust, given that animals have a constant presence in human evolutionary history.

Rozin et al. (2008) argue that core disgust consists of three different features: oral incorporation, a sense of offensiveness, and contamination. As Kelly (2011), following Rozin, characterizes the emotion, disgust consists of “aversion with a pronounced oral feel” (p. 17). The main evolutionary function of disgust, on this account, is to protect against potential contaminants.1 Indeed, Tybur, Lieberman, Kurzban, and DeScioli (2013) label core disgust

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1 Davey and Rozin proposed early on that disgust functions as a disease-avoidance mechanism (Davey, 1992; Rozin & Fallon, 1987)
“pathogen disgust,” to clarify that protecting against contaminants—particularly disease—is the primary functional role of disgust. This function is thought to have its origins in disease avoidance behavior in animals. For example, a wide range of species, from insects to mammals, systematically avoid fecal matter, decaying bodies, and other potential harbors of disease (see Curtis, de Barra, & Aunger, 2011 for a review). Aside from general avoidance, the primary way of protecting against contaminants is by blocking contaminants from invading the body, particularly through the mouth. This is what is meant by oral incorporation in Rozin et al.’s description of core disgust.

It might be obvious why animals are relevant here. As food and as vectors of disease, animals have served as a primary cause of death and illness in our evolutionary history. The preparation and consumption of infected animals, as indicated by oral incorporation, are key methods for transmitting disease. We can find evidence for this in studies on disgust-eliciting food, particularly with respect to meat. For instance, Martins and Pliner (2006) found that unfamiliar foods are rated as disgusting largely to the extent that they have animal origins. This would seem to be a result of a disgust-disease-avoidance mechanism. Other suggestive evidence comes from Fessler and Navarrete (2003), who looked at food consumption in 78 different cultures and found that meat was the most highly regulated food item. Given the possibility of infection from eating meat, it would make sense for people to regulate its consumption, and for disgust mechanisms to be driving such regulation.

A number of analyses have indicated that one of the main predictors of outbreaks of human diseases, from roughly 100,000 years ago to today, is increased exposure to animals (Jones et al., 2013; Morand, McIntyre, & Baylis, 2014; Wolfe, Dunavan, & Diamond, 2007). This includes wild (e.g., primates) and domesticated animals (e.g., dogs and livestock), as well as
“liminal” animals that are not domesticated but regularly take advantage of permanent human settlements (e.g., bird and rodent species). An estimated 58% of all pathogens affecting human beings are “zoonotic,” or can be transmitted between humans and animals (Woolhouse & Gowtage-Sequeria, 2005). Some zoonotic pathogens are very lethal. Of the 25 most deadly diseases in human history, 9 are due primarily to animal vectors, and in 20 of the 25 cases the transmission vector is classified as core disgust—things like feces, bodily fluids, lice, flies, and other bugs (Oaten, Stevensen, & Case, 2011; also see Curtis and Biran, 2001). This explains why core disgust functions to keep us away from certain animals.

Two evolutionary events are thought to have had a significant impact on our disgust responses to animals. The first is human migration out of Africa, roughly between 50,000 and 70,000 years ago. Some of the oldest pathogens currently found in human beings include *Toxoplasma gondii* (possibly transmitted from wild cats), tapeworms (likely from tainted meat), tuberculosis (possibly from rodents), and Epstein Barr virus (likely from monkeys). These are all thought to have been transmitted before human migration out of Africa, and may have been present up to 1 million years ago (Harper and Armelagos, 2013; Hoberg, Alkire, de Queiroz, & Jones, 2001). Lice, which can transmit a number of serious diseases (e.g., typhus), were also present prior to the move out of Africa and are known to reliably elicit disgust (Harper & Armelagos, 2013).

The second significant evolutionary event is the development of agriculture, around 10,000 years ago, where increased contact with animals coincided with increases in human population size and density (Barreiro and Quintana-Murci, 2010; Morand, McIntyre, & Baylis, 2014). Infection from tapeworms, malaria, and tuberculosis, all of which were present before the migration out of Africa, expanded significantly—and repeatedly—as humans and animals came
into closer contact (Comas et al., 2013; Harper and Armelagos, 2013; Karlsson, Kwiatkowski, & Sabeti, 2014). While older diseases became more severe and more lethal, other new zoonotic diseases arose, including measles (likely from sheep, goats, or cattle; Weiss, 2011), rotavirus (from a variety of domesticated animals), and many others. This long history of zoonotic disease transmissions indicates that it would have been adaptive for our ancestors to develop aversive responses to animals.

Given this evidence, it would appear that animals factor into core disgust either by being consumed or by transmitting disease through some other entryway into the human body. This dual role of animals in causing disgust has also been pointed out by Kelly (2011). Kelly’s account of disgust diverges slightly from Rozin, but the differences do not raise any significant issues that need addressing here. I will briefly describe Kelly’s account as complementary to Rozin’s in order to illustrate how this dual role might work.

On Kelly’s account, disgust consists of two “entangled” mechanisms: the poison mechanism and the parasite mechanism. They were once independent, according to Kelly, but in human beings are currently combined as a single disgust response. The poison mechanism responds to poisonous substances we might put in our mouths, and is responsible for providing the affect of disgust—what we feel. The parasite mechanism responds to things that indicate the presence of toxins—things like parasites and other pathogens. As Kelly points out, animals are important here because of their relevance to both categories. Animals are frequently ingested and frequently carry parasites and other pathogens. Simply the presence of animals might be a health risk, even if we are not in direct contact with them.

Kelly’s account helps makes sense of why we would avoid animals. As Kelly explains, the disgust system is geared to be overly sensitive and to produce a high rate of false positives. A
single false negative—failing to identify a legitimate risk—could be fatal, so it is worth erring on the side of caution. Many diseases are airborne, and, as we will see below, many are carried by flying insects. Our disgust responses are likely to be sensitive to these factors, leading us to exaggerate our avoidance of animals and steer clear of them more than is necessary. For instance, simply avoiding their ingestion, via the poison mechanism, would not be sufficient. This avoidance response, as well as other functions of disgust, will be explained in the next section.

2.2 How Disgust Works

As I just mentioned, one main function of disgust is to be overly sensitive to potential contaminants, in a way that produces many false positives. There are a number of well-known examples of this: chocolate can elicit disgust if made to look like feces, and people will refuse to drink out of a glass that previously contained a dried and sterilized cockroach, even if they are told that doing so would be safe (Rozin, Millman, & Nemeroff, 1986). This is just one of many features of disgust that suggest the disgust response is automatic and invariant to a significant degree. Once the disgust mechanism is triggered, it cannot be modified. The system springs into action to protect against the contaminant, rather than work to determine whether the contaminant does in fact carry the risk of infection. As Kelly (2011) describes it, the disgust system is “unified” or “clustered” (p. 40) in its response. In essence, this means that once the disgust system is triggered, a chain of responses follows automatically.

I will describe three other important features of the disgust system. Each of these appears to be automatic and invariant, as just described. These do not exhaust the disgust response, but they are essential functions of the system, particularly in responding to animal triggers.
The first feature is protection of the “bodily envelope.” Though many disgust researchers agree that disgust is the foremost protector of the mouth, it also functions to protect any gateway to the body. For instance, in a classic study, Rozin, Nemeroff, Horowitz, Gordon, and Voet (1995) asked people how they would feel if either a clean Q-tip or a Q-tip that had been licked by a stranger was placed in or on different parts of their body. The parts of the body that elicited the strongest negative emotions were those that serve as gateways to the body, primarily the mouth and genitalia. People are also more disgusted by the thought of transplanting “interface parts,” or those that serve the gateway function (like the mouth), than they are other internal parts of the body (Fessler & Haley, 2006).

The second feature expands on the oral incorporation feature already described. Since disgust primarily protects the mouth, as the chief gatekeeper of the body, it may be no surprise that the disgust response activates the entire digestive system. Even things that are not normally consumed, such as blood and feces, still activate a disgust response that employs the digestive system. For instance, nausea and increased salivation are part of the disgust response, as is the classic “gape” face (think about the way someone’s face looks right before they begin to vomit). Anyone who has experienced extreme nausea or has spent extended periods of time in a state of near-vomit knows that these experiences are highly noxious and unpleasant. This is important to note because these responses are part of any disgust response, not just those related to ingestion. So, for example, someone who is disgusted by animals will undergo this sort of visceral and gustatory response, regardless of whether or not they consume animals or have consumption-specific disgust.

The third feature follows from the two already mentioned. Perhaps the most crucial feature of disgust is that it is an aversive emotion. It is hypothesized to be driven by two different
systems with the same acronym: the Behavioral Inhibition System (Carver & White, 1994; Olatunji, Haidt, McKay, & David, 2008) and the Behavioral Immune System (Schaller, 2006; Schaller & Murray, 2008; Schaller & Park, 2011). Both systems are influenced by and consistent with Rozin’s idea that disgust functions to avoid contaminants (Neuberg, Kenrick, & Schaller, 2011). These systems are important because they motivate withdrawal. The Behavioral Immune System is involved with protection from potential contaminants of both a biological (e.g. bodily fluids) and social nature (e.g., people who one finds disgusting). The Behavioral Inhibition System includes a variety of emotions (like fear and sadness) that motivate withdrawal and removing oneself from whatever is triggering the system. For disgust, the trigger is potential contagion. For instance, the response that follows from being disgusted by animals is dislike, aversion, and avoidance. As might be obvious, the reason it does this is to protect the bodily envelope, particularly the mouth. So not only does disgust produce high rates of false positives, it also produces exaggerated avoidance responses. This ensures adequate protection from disease.

To summarize, the research cited here suggests that our disgust response to animals is likely to be exaggerated and contain many false positives, it will be engaged simply by the presence of animals, regardless of whether they are for consumption or might actually be placed near our mouths, and it is invariant and automatic. Once an animal is perceived to be disgusting, the avoidance response follows automatically. Disgust researchers also generally agree that disgust is highly unmodifiable and unresponsive to cognitive control (e.g., Russell & Giner-Sorolla, 2013). Core disgust elicitors are hard to unlearn, even with habitual exposure. For instance, treatment for spider phobias tends not to generalize beyond spiders (Smits, Telch, & Randall, 2002). In one suggestive study from Rozin (2008), the disgust responses of medical students who regularly dissected cadavers were only reduced over time in response to cold
bodies, but not recently deceased warm bodies. From this, Rozin concluded that learning new information about any particular disgust elicitor is uninformative about any other disgust elicitor. With respect to animals, this suggests that reducing one’s disgust response for any particular type of animal will fail to generalize to any others.

A key question, of course, is which animals elicit disgust. The history of zoonotic disease transmission suggests that a wide range of animals will elicit disgust, but that some animals are more pathogenic than others, and so perhaps should elicit a greater degree of disgust. The next section will attempt to provide a more precise analysis of what types of animals elicit disgust.

2.3 Which Animals Elicit Core Disgust?

A taxonomy widely used by disgust researchers distinguishes between predators, who primarily elicit fear, slimy invertebrates, who primarily elicit disgust, and a category in between these two containing a wide variety of different animals that elicit both fear and disgust. Tigers and sharks, for example, elicit fear, while snails and maggots elicit disgust, and rats, cockroaches, and spiders elicit both fear and disgust (Matchett and Davey, 1991; Ware, Jain, Burgess, & Davey, 1994; Webb & Davey, 1992). While the exact set of animals within these categories varies cross-culturally, the categories themselves seem to exist across all cultures (Curtis & Biran, 2001; Davey et al., 1998; Rozin & Fallon, 1987).

What is important in providing an account of animals as disgust elicitors, however, is identifying which animals cause disgust because they are linked to disease and other pathogens. The history of zoonotic disease transmission, as discussed above, indicates that a wide range of animals should elicit disgust-based avoidance behaviors. Roughly, what we should look for is
evidence that disgust responses to animals are related to disease avoidance, or confer some sort of health benefit. I will discuss three experiments that help illustrate such a relationship.

One widely cited study comes from Curtis, Aunger, and Rabie (2004). They conducted a large cross-cultural study (over 40,000 participants), comparing people’s reactions to a variety of different disgusting photos. Some of the photos were disease-relevant while others were disease-irrelevant, but participants were not informed of this difference. For instance, lice, which can transmit diseases to humans, were compared to wasps, which cannot. Another example is Ascaris worms (disease-relevant), which were compared to caterpillars (disease-irrelevant). The results showed that people indeed rated the disease-relevant photos as more disgusting than the highly disgusting but disease irrelevant photos. This would seem to provide evidence in favor of the disgust-disease relationship.

Another study comes from Prokop, Fančovičová, and Fedor (2010). They presented people with the pictures from Curtis, Aunger, and Rabie’s experiment (some of which were disease-relevant and others that were not), and asked them to rate the extent to which they were afraid or disgusted by each picture. Participants also took a standard health survey that included questions about the participants’ antiparasite behaviors, some of which were relevant to animals. For instance, one question asked, “Do you pet wandering/home cats/dogs?” As expected, the disease-relevant insects elicited more fear and more disgust than the disease-irrelevant insects. Interestingly, people who were more disgusted by disease-relevant insects as well as those who were more fearful of disease-irrelevant insects also reported more antiparasite behaviors. Though the animal-related questions did not receive their own analysis, these results suggest those who are disgusted by and afraid of insects are likely to engage in animal avoidance more broadly.
The third experiment addresses disgust oriented towards domestic pets. Prokop and Fančovičová (2011) asked pet owners to fill out a survey designed to assess their vulnerability to disease. Participants were also asked to rate four additional questions pertaining to their pets, two relevant to parasite transmission (“I allow my dog/cat to lick me,” “I allow my dog/cat to sleep in my bed”) and two associated with parasite avoidance (“I worm my dog/cat regularly,” “I frequently get rid of my dog/cats feces”). They found that pet owners generally perceive themselves as having low vulnerability to disease in general. Interestingly, however, parasite transmission was positively correlated with parasite avoidance. That is, pet owners who made themselves more available to parasite transmission through close contact with their pets also made greater efforts to ensure that their pets were free of parasites. This is exactly what the core disgust account would predict. Even though pet owners saw themselves as less sensitive to disgust elicitors, they still took action to prevent disease transmission when they were knowingly putting themselves in direct contact with potential pathogens.

I take the experiments cited here to show that 1) a wide range of animals reliably elicit disgust in human beings, and 2) they do so because of their relationship to disease transmission. Slimy invertebrates and insects are prototypical disgust-elicitors because they tend to carry risk of infection for human beings, but it is also recognized that these entities can infect other animals—including large mammals—which produces a more generalized disgust response. Now I will discuss the second type of disgust, which will offer further reasons to think that a wide range of animals elicit disgust, beyond those that are obvious vectors of disease.

3. Animal Reminder, Mortality Salience, and Terror Management

3.1 Animal Reminder Disgust
As mentioned already, Rozin’s account of disgust claims that disgust protects us from seeing ourselves as “lowered, debased, and mortal.” The discussion of core disgust above, however, characterized disgust as a protector against various pathogens. So what connection is there supposed to be between contamination and mortality?

The line of research that has pursued this connection in greatest detail is known as terror management theory (TMT). TMT primarily derives from work in anthropology by Ernest Becker (1971, 1973, 1975). Within psychology, TMT was first developed by Sheldon Solomon, Jeff Greenberg, Thomas Pyszczynski, and colleagues (Greenberg, Pyszczynski, & Solomon, 1986; Greenberg, Pyszczynski, Solomon, Simon, & Breus, 1994; Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989; Solomon, Greenberg, & Pyszczynski, 1991). TMT starts from the assumption that human beings are regularly confronted with and experience acute feelings of existential anxiety. It is important for normal functioning that these feelings stay beneath the surface of consciousness, so we have developed various methods for repelling these feelings when they bubble to the top (for reviews of TMT see Burke, Martens, & Faucher, 2010; Goldenberg, Pyszczynski, Greenberg, & Solomon, 2000; Greenberg, Solomon, & Pyszczynski, 1997; Hayes, Schimel, Arndt, & Faucher, 2010; and Solomon, Greenberg, & Pyszczynski, 2004).

The hypothesized reason we possess this anxiety, at least with respect to animals, is that animals remind us we are mortal. This is what is referred to as animal reminder or mortality salience. According to Rozin and his colleagues, disgust is both “a defensive emotion that guards against the recognition of our animality” (Haidt, McCauley, & Rozin, 1994, p. 712) and “a defense against a universal fear of death” (Rozin, Haidt, & McCauley, 2000, p. 643). The result of these supposed threats is that human beings “wish to avoid any ambiguity about their status by accentuating the human-animal boundary” (Rozin and Fallon, 1987, p. 28). This process is
perhaps best explained by Goldenberg, Pyszczynski, Greenberg, and Solomon (2000):

The terror management solution to the problem of death is to live our lives on an abstract symbolic plane: We cope with the threat of death by embedding ourselves in a meaningful culture and living up to the culture’s standards. In this way, we elevate ourselves above the rest of the animal kingdom. (p. 203)

The basic connection between disgust and TMT is that disgust helps us avoid those things that cause us existential anxiety: animals. More will be said about this below.

The adaptive value of TMT, and the role of disgust within TMT, is much disputed. Greenberg, Solomon, and Arndt (2008) propose that as our hominid ancestors became more intelligent, they may have become more cognizant of the inevitability of their own death, and experienced incapacitating anxiety as a result. As they explain, “awareness of ourselves as objects existing in the world, juxtaposed with the capacity to imagine future possibilities, rendered our ancestors aware of a wide variety of potential threats to their continued existence, many of which were fatal and uncontrollable” (p. 116). This recognition would have made our ancestors less capable of actually addressing threats, and so it would have been adaptive to possess mechanisms, like disgust, for avoiding reminders of death or to develop mechanisms for suppressing death-related thoughts. However, many have objected that it’s not clear why increased intelligence would lead to anxiety about one’s death (Navarrete, 2005; Kirkpatrick & Navarrete, 2006). Moreover, it seems unlikely that animals would be a source of this anxiety, given the close proximity of animals and humans throughout our history. More will be said about this below when addressing criticisms of TMT.

One way of testing TMT is by manipulating people’s thoughts of death (thus modifying mortality salience). Making death more salient increases people’s existential anxiety, or so the hypothesis runs. The traditional method of doing this is by presenting participants with a death prompt. The most commonly used death prompt asks participants to describe the emotions they
feel when they think of their own death and what they think will happen, physically, when they
die. Other popular and more implicit death primes include reading articles about death, word
searches and sentence completion tasks that include death-related words, and interviewing
participants in or near a cemetery or funeral home. The typical result of the death prompt is that
people are inclined to rate death and disgust-related items negatively.

Though these death primes might seem somewhat artificial and uncommon in everyday
life, TMT researchers generally suppose that our lives are filled with more mundane death
primes that function in essentially the same way. For instance, other effective elicitors of
mortality salience include cancer (Arndt, Cook, Goldenberg, and Cox (2007), breast exams
(Goldenberg, Arndt, Hart, & Routledge, 2008), 9/11 (Landau et al., 2004), old people (Martens,
Greenberg, Schimel, & Landau, 2004), people with disabilities (Hirschberger, Florian, &
Mikulincer, 2005), and fecal matter (Dunkel, 2009), among many others. These are relatively
common.

What comes after the death prompt in TMT studies generally varies according to other
variables being measured. Rather than test anxiety as such, TMT researchers typically measure
the predicted response to repelling this anxiety (though direct studies of anxiety and other mental
states exist as well; e.g., Routledge, Ostafin, Juhl, Sedikides, Cathey, & Liao, 2010). The most
well-confirmed methods for repelling the anxiety produced by mortality salience include 1)
affirming one’s core values and beliefs, or the values and beliefs of one’s culture, and 2)
increasing one’s self-esteem (Gailliot, Stillman, Schmeichel, Maner, & Plant, 2008; Harmon-
Jones et al., 1997; Schmeichel et al., 2009; Schmeichel & Martens, 2005).

I will briefly discuss three experiments illustrating that animals cause death-related
thoughts and that this process incorporates disgust. In a classic study, Goldenberg et al. (2001)
presented participants with the traditional death prompt, followed by a disgust assessment. The death prompt led to higher ratings of disgust for all types of core disgust elicitors, but ratings were particularly high for bodily products (e.g., vomit) and animals (maggots, worms, rats, and cockroaches). This indicates that mortality salience activates core disgust mechanisms that seem to be particularly attuned to animals.

Another illustrative experiment comes from Cox, Goldenberg, Pyszczynski, and Weise (2007). They found that presenting people with descriptions of core disgust items (e.g., “It would bother me to see a bowel movement left unflushed in a public toilet”), when combined with a human-animal similarity prime, led to increased use of death-related words in a word completion task. The core disgust prime was insufficient on its own to produce increased thoughts of death, indicating that the human-animal similarity prime played a crucial causal role.

Perhaps the best evidence in support of the claim that animals elicit mortality salience comes from Beatson and Halloran (2007). They presented participants with the traditional death prompt as well as an animal stimulus, which was a video of bonobos having sex. In the High Creatureliness condition, as they called it, the researchers emphasized to participants how similar bonobo sex is to human sex. In the Low Creatureliness condition, the differences between the species’ sex habits were emphasized. Participants’ self-esteem was measured, as were their attitudes to animals. The results were consistent with TMT and indicate that bonobo sex elicits mortality salience. Among those in the High Creatureliness condition, where bonobo sex was compared to human sex, those with low self-esteem evaluated animals more negatively, while those high in self-esteem evaluated animals more positively. These results are exactly as would be predicted by other classic TMT studies.\(^2\) Reminding people of their animal nature caused negative evaluations, unless the level of self-esteem was sufficient to fend off the attendant

\(^2\) For a replication with pet-owning participants see Beatson, Loughnan, & Halloran (2009).
existential anxiety.

These experiments indicate that animals do indeed function as mortality salience enhancers, and that this leads people to judge animals negatively. Now I will briefly address some prominent criticisms of TMT, particularly with respect to animals.

3.2 Criticisms of Terror Management Theory

There have been a wide variety of criticisms of TMT, many of them aimed at the role of animals. While the results themselves seem extraordinarily robust, the theoretical foundations of TMT are somewhat shaky. A well-known article by Tybur, Griskevicius, and Lieberman (2009) identifies a number of the pertinent theoretical problems. One, as mentioned above, is that it’s not clear why existential anxiety would have any adaptive function, particularly anxiety caused by animal reminders. It is incapacitating, and it’s not clear why or what it helps us accomplish. It’s also not clear why a disgust response, appealing to one’s worldview, or increasing one’s self-esteem would be particularly suited for repelling existential anxiety. It’s also not evident that people actually avoid being reminded of their animality. As numerous commenters have pointed out, mundane animal behaviors, like breathing and sleeping, don’t seem to elicit disgust (e.g., Strohminger, 2014; Tybur et al., 2013).

I will address another criticism from Tybur et al. (2009) that will help in responding to those just mentioned. Tybur et al. argue that there isn’t any feature in common between different types of animal reminder stimuli, and thus it is difficult to see how animal reminder disgust would have evolved. Sex, bad hygiene, corpses, and flesh wounds all elicit animal reminder disgust and are classified as such, but these factors do not seem to have anything in common with animals (or each other). If anything, they are all pathogen related, not reminders of our
animality. And avoidance of pathogens has a clear evolutionary purpose, while being sensitive to animal reminders does not. For this reason, Tybur et al. argue that animal reminder disgust should be understood as a variety of core disgust (what they call pathogen disgust), with no adaptive purpose of its own.

I have three replies to these criticisms. First, an important unifying feature of animal reminder disgust elicitors is the specific response they elicit: animal reminders cause anxiety that is alleviated by broadening the human-animal boundary, by affirming one’s worldview, and increasing one’s self-esteem. This is a quite specific response that is not caused by a number of other things, including a number of other disgust elicitors. For instance, reading about animal abuse does not increase thoughts of death (Das, Bushman, Bezemer, Kerkhof, & Vermeulen, 2009). Other studies have also consistently found that animal reminder is indeed a dissociable component of the disgust response, even cross-culturally (Olatunji, Ebesutani, Haidt, & Sawchuk, 2014; Olatunji, Haidt, McKay, & David, 2008; Olatunji et al., 2009). So regardless of concerns about the ultimate explanation for animal reminder disgust, its role in producing mortality salience is extremely robust. Moreover, there are hundreds of other studies that have tested a wide variety of alternative explanations for mortality salience (besides animal reminders), and none of the alternatives have proved tenable (e.g., increased arousal or other sources of anxiety; see Goldenberg et al., 2000 and Greenberg et al., 2008 for a review).

Second, many of the objections mentioned above can be addressed by looking at cases where animals present a clear threat to one’s humanity. In Batson and Halloran’s experiment above, for example, it was only when bonobo sex was explicitly compared to human sex that mortality salience was induced. Mundane animal behaviors, like breathing and sleeping, do not
elicit mortality salience because they present no clear threat to one’s humanity.\textsuperscript{3} If these mundane behaviors were described to people in a way that threatened human uniqueness, for example, it is more likely that they would elicit mortality salience. In general, \textit{emphasizing} shared animality is responsible for eliciting mortality salience and increasing disgust felt toward animals (for a review, see Heflick & Goldenberg, 2014). To further illustrate this point, consider another classic finding in TMT research, that those who score high in neuroticism (according to traditional clinical diagnoses) tend to rate the physical aspects of sex much more negatively compared to the romantic aspects (Goldenberg, Pyszczynski, McCoy, Greenberg, & Solomon, 1999). Interestingly, this can be replicated in non-neurotics simply by telling them that humans are similar to animals. It can also be reversed in neurotics by telling them that humans are \textit{different} from animals (Goldenberg, Cox, Pyszczynski, Greenberg, & Solomon, 2002). This would seem to provide good evidence for the role of animals within mortality salience and TMT.

Third, we can accept Tybur et al.’s adaptive explanation that animal reminder disgust is derived from core disgust without detracting from the proposed function of animal reminder disgust. Tybur et al.’s account in fact helps explain the evolution of animal reminder disgust. The insight that can be taken from their argument is that mortality salience and animal reminder disgust have evolved largely because their common elicitors are related to disease transmission. Sex, bad hygiene, corpses, and flesh wounds are all pathogen-related, and as such they constitute threats to one’s existence. This can be used to explain why they motivate withdrawal behaviors, like core disgust elicitors, and also cause thoughts of death, like animal reminders. The adaptive account and the functional explanation are thus not in conflict.

\textsuperscript{3} A similar response can be applied to Fessler and Navarrete’s (2005) objections against mortality salience and TMT. They found that disgust sensitivity decreases with age, which they argued was contrary to the predictions of TMT, since people become closer to death as they age. It could be argued in reply, however, that gradual aging does not adequately emphasize the salience of death.
In summary, the criticisms of TMT and animal reminder disgust outlined above do not seem persuasive. Animal disgust elicitors are unified in that they cause mortality salience, animals in particular are effective in producing this response, and the evolution of core disgust goes some way toward explaining why mortality salience would have become involved in the disgust response. Some puzzles remain, however, about how we have continued to have close relationships with animals, given the disgust responses we have developed toward them. This issue will be taken up in the next section.

4. Animal Disgust: An Explanatory Challenge

4.1 The Challenge

The widespread presence of animals in human lives seems somewhat paradoxical, given the research discussed thus far. Animals tend to trigger feelings of disgust and thoughts of death in human beings, leading us to avoid them and judge them negatively. The research presented on both core and animal reminder disgust furthermore indicates that the disgust response encompasses a wide range of animals.

The explanatory challenge is quite simple: How do we explain the presence of animals in our lives? How do we cope with them, given that they elicit disgust? I will address these questions in this section in the context of research on dehumanization and infrahumanization.

4.2 Dehumanization and Infrahumanization: Responding to the Explanatory Challenge

Some of the most intriguing research on our moral evaluations of nonhumans has come from studies of how we use the classification of “animal” to demean other human beings. Various studies have shown that this process is primarily driven by feelings of disgust and
frequently targets outgroups. This maps well onto research on perception of nonhumans. To consider some highlights: Boccato, Capozza, Falvo, and Durante (2008) found that subliminal presentation of monkey faces facilitated identification of outgroup names but human faces did not; Costello and Hodson (2010) found that people who perceived a greater divide between humans and other animals were more likely to engage in racial dehumanization (among human beings); and Buckels and Trapnell (2013) found that experimentally induced disgust produced stronger implicit associations between animals and an outgroup than did induced sadness or induced neutral mood.

In general, there are two types of processes people use in these sorts of classifications (Haslam & Loughnan, 2014). One is called dehumanization, which refers to the process of explicitly identifying other people (or groups of people) as nonhuman. The other process is called infrahumanization, which refers to the process of identifying other people (or groups of people) as inferior human beings. While they are still attributed various key human qualities, they are treated as inferior to some other group by comparison. What is surprising in infrahumanization is that it produces a certain level of positive evaluation. It is not thoroughly intended to demean others, just enough to make it clear who is superior. This maps well onto how we treat some nonhumans. We live with them and show them care, but in many cases, continue to see ourselves as dramatically superior.

In this section, I will make a proposal. The discussion of disgust thus far has raised a problem for explaining the role of animals in human lives. Namely, it’s not clear why we would seek out their company, let alone show them moral concern or affection, given that they are universal disgust elicitors (along multiple dimensions). The processes of dehumanization and infrahumanization potentially illustrate why this is and how this works. Animals, just like human
outgroups, cannot really be avoided. We must live with them. Animals and humans were in close contact long before domestication (Serpell, 1996). And it’s hard to imagine how anyone in contemporary societies could avoid animals entirely. People are thus forced to live among disgust elicitors.

The prediction would be that some sort of coping mechanism must be in place for this. A strategy that comes out of the TMT discussion above is that we would find ways to elevate ourselves above animals. This in itself is not sufficient, however, since animals are pervasive in contemporary society, so we would need to apply this coping mechanism constantly. It also fails to explain why we frequently find animals appealing and judge them positively. Rather, I think we should look to the positive evaluations that result from dehumanization and infrahumanization for assistance. On the face of it, this too is a puzzling feature of our disgust response. The role played by disgust in these processes is to remove “contaminated” others from ourselves—consistent with the biological origins of disgust. Yet dehumanized others still receive various positive attributions. The solution I see is as follows. We can’t always avoid those we have dehumanized or find disgusting, such as animals. For instance, in human evolutionary history it would have been costly to avoid animals, regardless of the disgust they caused. Attributing various positive human qualities to dehumanized others—sometimes even to the point of explicit exaggeration (as in anthropomorphism)—makes it easier to live among things that elicit disgust.

This can be seen as analogous to the case of sex, where it has been found that sexual attraction decreases disgust sensitivity, perhaps because core disgust (e.g., toward bodily fluids) would otherwise deter people from engaging in the act of reproduction (Ariely & Loewenstein, 2006; Borg & de Jong, 2012). Though in some instances this would be evolutionarily
advantageous (e.g., in avoiding sexually transmitted diseases), in general it would have been enormously adaptive to possess sex-specific mechanisms for overcoming core disgust. Similar mechanisms, I am suggesting, would likely have evolved in order to overcome our disgust toward animals.

Developing this proposal requires further discussion of dehumanization and infrahumanization. Leyens et al. (2001) was the first to propose the general outlines of the classification system described above. Haslam (2006) refined this further to identify two further processes that lie at the heart of dehumanization and infrahumanization. One type, called *human uniqueness*, denies to another entity properties that are considered uniquely human. This is what is often denied to animals. Accusing others of being shameless, lacking humility, or being unsophisticated are common examples. The second type, called *human nature*, pertains to properties that are essentially human, though they may not be unique to humans. Common examples include accusing someone of being insensitive, unreflective, or reckless. These tend to be denied to robots and machines.

So what this predicts is that animals, and various human outgroups, will be denied uniquely human traits but still be attributed essential human traits. What actually happens, however, is that animals in particular are attributed these essential traits to a *greater degree* than other human beings. In one widely cited study of this (Haslam, Kashima, Loughnan, Shi, & Suitner, 2008), animals were judged to be more perceptually capable than humans, in having a greater ability to hear, smell, taste, and see. Their ability to experience basic emotions (like anger, disgust, excitement, fear, and surprise) and volitional states (like needing, wanting, and willing) were judged to be nearly equivalent to human beings. The states that were denied to

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4 The sample consisted of participants from Australia, China, and Italy. 37 mental states total were measured for animals, robots, and supernatural beings.
them were higher cognitive states (like knowing, reasoning, and imagining), and more complex emotions (like admiration, enjoyment, love, pride, and resentment). So animals are not as reflective as human beings and lack complex emotional abilities, but are more perceptual and possess similar basic emotions. It is problematic, of course, that Haslam et al. did not specify to participants which animals were in question, but this basic phenomenon is interesting nonetheless.

One prominent feature commonly cited in explaining why we like animals and (for some of us) bring them into our homes is that they provide companionship. Indeed, recent studies by Epley, Waytz, and Cacioppo (2007) show that people who score high in a need for social connection are more likely to attribute mental states to animals. The problem I have highlighted is that the disgust eliciting powers of animals make this seem strange. But by hypothesis, even those who like animals for companionship would be bothered if their pets were not clearly relegated to an inferior class of beings.

Given the pervasiveness of pets, it is helpful for us to have a stock of anthropomorphic terms to describe their behaviors. The proposal I am making is that this is precisely what allows us to not feel threatened by animals. The particular mental states we attribute them solidifies their infrahumanized status. They are evaluated positively (e.g., being adept perceptually) but in a way that indicates they are not human. Though I do not know of any research that would confirm this, TMT studies demonstrate that the human-animal boundary is comforting when we are presented with reminders of our mortality. If animals do indeed make mortality salient to us, it would be helpful to have a quick way of reinforcing the human-animal boundary. The mental states we attribute animals—the ones resulting from a disgust-driven infrahumanization process—seem to play this role perfectly.
5. Concluding Thoughts

This paper surveyed research indicating that animals cause disgust through two different mechanisms: core disgust and animal reminder disgust (or mortality salience). In short, animals activate systems designed to protect us from contaminants, which leads us to show aversion towards animals. The aversive reactions caused by animals, I suggested, raise a further challenge for psychologists: explaining how we cope with animals, despite their disgust-evoking powers.

To address this explanatory challenge, I drew from research on dehumanization, and proposed that we cope with animals, and our disgust responses to them, by attributing mental states that include positive evaluations but simultaneously “mark” animals as inferior beings. That is, animals are evaluated positively but in a way that indicates they are sub-human. Though strong empirical evidence for this relationship is lacking, I hope to have produced testable hypotheses for future research on TMT and disgust toward animals.

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