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Not Just Disgust: Fear and Anger Also Relate to Intergroup Dehumanization

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One of the most extreme expressions of prejudice is likening groups to non-human beings. Previous research relates disgust to dehumanization of social groups. However, prior studies have not examined other negative emotions in relation to dehumanization. We examined whether three emotions – anger, disgust, and fear – are associated with dehumanization of social groups. In Experiments 1 and 2 we tested these relationships measuring reactions to real groups. We found that all three emotions were uniquely related to animalistic and humanity-denial dehumanization, but only fear was related to mechanistic dehumanization. Using an orthogonal emotion grid measure in Experiment 3, we showed anger to play a primary role in dehumanization among a variety of target groups. Finally, in Experiment 4 we manipulated whether a novel group was abnormal or harmful, and found that both groups elicited more dehumanization than the control group; however, the harmful group elicited dehumanization mediated by anger and the abnormal group elicited dehumanization mediated by disgust. From this evidence, we argue that other emotions besides disgust play an important part in the dehumanization of outgroups.

Dehumanization, denying that a social group is fully human, is the ultimate expression of prejudice, accompanying the most horrific instances of discrimination throughout history, such as slavery and genocide. Numerous studies have demonstrated that social outgroups are thought to be less capable of feeling complex, uniquely human emotions, such as pride or guilt (e.g., Leyens, Rodriguez, Rodriguez, Gaunt, Paladino, Vaes, & Demoulin, 2001). Building on this evidence, Haslam (2006) has proposed two distinct sets of human qualities or characteristics in social perception, which relate to different forms of dehumanization. People can elicit *mechanistic dehumanization*, being likened to machines and denied characteristics of *human nature*, such as warmth and curiosity. On the other hand, people can elicit *animalistic dehumanization*, being likened to nonhuman animals; here, the characteristics denied are *unique to humans*, such as intellect and self-awareness.

On a more basic level than the denial of emotions or traits, prejudice can manifest itself in mere associations between outgroups and animal-related terms or images, whether measured implicitly or explicitly (Goff, Eberhardt, Williams, & Jackson, 2008; Viki, Winchester et al., 2006). It is this metaphorical form of dehumanization that we

find particularly telling, as it gives direct evidence for the denial of human standing to other groups. However, there is debate as to whether metaphorical dehumanization merely represents antipathy or dislike, with recent findings indicating that metaphorical dehumanization is related but distinct from dislike (Bruneau, 2018). We present evidence that not only can humans be ascribed as being animal, machine like, or lacking of general human essence, but that dehumanization is associated with different hostile emotions, such as anger, disgust, or fear.

Research also shows the importance of emotions in intergroup prejudice and hostility, particularly anger, disgust and fear (Cuddy, Fiske, & Glick, 2007; Cottrell & Neuberg, 2005; Mackie, Devos, & Smith, 2000). Given the importance of dehumanizing beliefs and negative emotions in prejudice and hostility, we might ask how the two are related. In four studies, two correlational and two experimental, we examined the relationships of disgust, fear, and anger with dehumanization, showing that they each contribute separately to variance in dehumanization.

Disgust

Writers and researchers often assert that disgust stands in a special relationship to dehumanization. Haslam's (2006) review proposed that disgust might be uniquely associated with animalistic dehumanization, i.e., seeing a group in animalistic terms, while indifference is associated with mechanistic dehumanization. Experimentally, Harris and Fiske (2006) found that groups perceived as

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being both incompetent and unfriendly fail to activate parts of the brain that are essential for social cognition, such as the medial prefrontal cortex, which they took as evidence for dehumanization. Additionally, the insula and amygdala, two parts of the brain related to feelings of disgust, were activated in reaction to these groups, suggesting that disgust is related to dehumanization. Further research has shown that these patterns of brain activation are correlated with specific attributions (Harris & Fiske, 2011). For example, activation of the insula was inversely related to perceptions of warmth. In other research, disgust sensitivity has been shown to predict prejudice against groups such as immigrants and foreigners, with dehumanization as an important mediator (Hodson & Costello, 2007). In an experimental demonstration, Buckels and Trapnell (2013) manipulated incidental disgust in a situation and showed it to increase dehumanization of outgroups. In sum, existing research shows a strong tradition of positioning disgust as a precursor or mediator of dehumanization.

Theories of emotion give several reasons why disgust might be associated with dehumanization. There is consensus that disgust helps to defend the body against literal contamination by disease (e.g., Curtis, De Barra, & Aunger, 2011; Oaten, Stevenson, & Case, 2009; Rozin, Haidt, & McCauley, 2008). However, other functions for disgust have been proposed to coexist, namely to: a) protect against moral contamination from abnormal acts (e.g., Graham, Haidt, & Nosek, 2009; Horberg, Oveis, Keltner, & Cohen, 2009; Rozin, Lowery, Imada, & Haidt, 1999), b) defend reproductive resources against abnormal mating choices (e.g., Tybur, Lieberman, & Griskevicius, 2009), and c) defend the self or group against status contamination from hierarchically lower people or groups (e.g., Keltner & Haidt, 1999). Animals are often a vector for pathogens (Curtis et al., 2011). They are seen as ontologically lower than humans (Brandt & Reyna, 2011), and do not follow cultural norms when it comes to morality, sex, excretion, or eating. For all these reasons, it seems plausible that under the functional assumptions of appraisal theory, disgust would follow on from the same kinds of threat appraisals that ultimately lead to inferences of animalness in humans.

Despite their compelling findings, previous studies have only tried to confirm the hypothesis that animalistic dehumanization relates to disgust. But dehumanization may be linked with other specific negative emotions, because dehumanizing qualities are associated with both literal and metaphorical threats and the variety of hostile emotions the threats characteristically evoke. For example, while disgust is triggered by threats of contamination (of health or values), fear has been shown to be triggered by threats to physical safety, and anger by a variety of threats, such as harmful actions or potential goal obstruction (Cottrell & Neuberg, 2005). Additionally, a review suggests that the insula, which has been connected to dehumanization, is not uniquely relevant to disgust, but instead responds to any emotion with high arousal content (Chapman & Anderson, 2012). Thus, there are reasons to examine contributions to dehumanization from two other emotions often classed as "basic" (Ekman,

1999): fear and anger, as they are both high in arousal and triggered by threatening or hostile events.

Why Fear?

Not all negatively judged animals exclusively elicit disgust, and the same applies to human groups, which can elicit other hostile emotions that emerge from the same threat appraisals that can also elicit dehumanization. For example, it seems clear that a tiger, as opposed to a rat, is more likely to evoke fear than disgust, due to the attributes of a tiger (e.g., potentially violent) versus a rat (e.g., dirty). Some analyses of intergroup fear attribute the elicitation of fear to the perception that a group is threatening because of its power or status (e.g. Mackie et al., 2000; Giner-Sorolla & Maitner, 2013). Other theories have linked fear to the threat of physical harm to oneself or to the ingroup (Cottrell & Neuberg, 2005). Of these two appraisals, it would seem that the threat of harm is more likely to be involved in dehumanization via fear. This is because of the expectation that animals are capable of causing harm, which underlies many animal phobias (Amoit & Bastian, 2015) – to the extent that reminders of the animalistic nature of violence can reduce support for war (Motyl, Hart & Pyszczynski, 2010). However, power in general can be expressed in more ways than physical violence, some of which are uniquely human (e.g., political or financial power), so the general construct of power is less likely to explain any fear-dehumanization link. Similar to the appraisal model in which contamination appraisals engender disgust, we think that physical threat could elicit fear, which would exist in parallel with dehumanization and possibly also intensify it.

What kind of humans, then, might be likened to animals because they elicit fear? In a philosophical discussion of evil, Haybron (2002) writes, "Seriously to regard someone as evil is to claim him ineligible for any human relationship … The evil person is something of an alien, lying somewhere between the human and demonic. We call her, not coincidentally, a *monster*" (p. 277). Evil persons, unrestrained by morality and desiring harm to others, are often spoken of metaphorically as dangerous predators – wolves or sharks – or as "inhuman" or "inhumane." Intentional harm poses an intensified threat because the harmdoer is likely to persist, unlike an accidental harmdoer. The intent to harm also implies that the harmdoer is animalistic, lacking reflection or moral feelings that would restrain the commission of violence. Indeed, evil people who threaten harm are viewed with metaphors of animalistic dehumanization (Morera, Quiles, Correa, Delgado & Leyens, 2018). So, if fear is related to animalistic dehumanization of a group, this might be because the group is seen as morally deficient and evil, like an animal that preys on humans. A group seen as having harmful intents and desires instead of the moral restraint expected from a human being, we believe, is most likely both to be compared to animals, and to elicit fear.

Why Anger?

Anger can be elicited within numerous intergroup contexts, and has been linked to nearly every kind of threat in Cottrell and Neuberg's (2005) socio-functional

approach to prejudice. Therefore, it seems reasonable to assume that anger is important when evaluating other groups. Most importantly, as with fear, anger can be felt when we perceive that an entity – including an animal – threatens harm to the self or ingroup. Anger has been analyzed in evolutionary terms as a display emotion that communicates formidability, or the intent to fight, whether in the context of defending a group against a predator or defending one's own social position against challengers (Sell, Tooby, & Cosmides, 2009). Because of this display function, anger is most useful if it is keyed to the perception that a social threat has intentionality behind it. Logically, a display of anger would not deter a threat without intentionality (such as an avalanche) but could do better in deterring an intentional agent, such as an animal or a hostile human. Anger has also been linked with contextual appraisals relevant to intentionality, such as the agency of others for a negative outcome (Weiner, 1980), intentionality of wrongdoing in moral situations (Russell & Giner-Sorolla, 2011), and perceptions of responsibility when judging criminal behaviors (Goldberg, Lerner, & Tetlock, 1999). Based on these findings, the same appraisals of threat to cause harm might lead people to feel anger as well as fear toward groups, and also to liken them to animals.

Animalistic versus mechanistic dehumanization
So far we have discussed possible links between emotions and seeing other groups as animals. However, research to this date has not examined the emotions associated with mechanistic dehumanization. Specifically, mechanistic dehumanization has not been studied in conjunction with disgust, but is unlikely to be related to that emotion strongly. Disgust, as we have mentioned, appears configured to defend us against biological threats. Indeed, disgusting animals tend to be disease vectors (Oaten, Stevenson, & Case, 2009). Animals also pose a disgusting threat by refusing to observe the behavioral codes of human culture (Rozin, Haidt, & McCauley, 2008). Machines and inanimate objects, however, are neither intrinsically contaminating nor capable of disgusting behavior. With no basis for disgust, and little intentionality or responsibility to cause harm from which to derive anger, the main emotion of prejudice toward a group classified as "machines" might be fear based on perceptions of their power to harm, since being machine-like they do not have the mental capability to perform intentional harm or to spread contagion. Some notable examples from film would be the robot assassin in "The Terminator," the soulless, visored Teutonic knights in Eisenstein's film "Alexander Nevsky," or the mechanistic imagery surrounding the emotionless Soviet boxer Ivan Drago in "Rocky IV." Recent evidence has found that evil persons, such as terrorists or mercenaries, can elicit mechanistic as well as animalistic dehumanization (Morera et al., 2018). The authors argue that this is because evil persons can be simultaneously seen as capable and also savage-like. Therefore, it is plausible that certain groups can elicit both mechanistic and animalistic dehumanization, with the relevant emotion associated with mechanistic dehumanization being primarily fear.

Present research
Our research examined whether three emotions – anger, disgust, and fear — are associated with dehumanizing attitudes toward groups. Although contempt might also be seen as a basis for dehumanization, we anticipated empirical difficulty in separating measures of disgust from measures of contempt (e.g., in a cluster analysis of the English emotion lexicon by Shaver, Schwartz, Kirson and O'Connor, 1987, "disgust" and "contempt" clustered together at the lowest level). Therefore, in only the first study reported here, we examined results with contempt as a separate predictor of dehumanization. On the basis of contempt's poor initial showing as a separate predictor, we chose to focus on disgust, not contempt, in the remaining studies.

In Studies 1 and 2, people indicated their emotions and metaphorical dehumanization beliefs toward a variety of real social groups. To ensure a fair chance for the emotions to emerge as predictors, these groups were identified a priori as especially likely to provoke attitudes involving disgust in comparison to anger and fear, while others were expected to show predominance of anger and fear, or elicited disgust and anger/fear equally. We looked at multivariate relationships between the emotions of disgust, fear, and anger and animalistic dehumanization across social groups (in both studies). We expected that not just disgust, but anger and fear, would be independently related to animalistic dehumanization. We took a direct approach when measuring dehumanization through the attribution of terms to groups that define the human and animal categories (Viki et al., 2006). Specifically, this measure enables us to directly test the hypothesized relationships between specific emotions and animalistic dehumanization.

We also tested whether disgust, anger, and fear relate to a lowered tendency to use uniquely human terms (e.g. "people"). However, our predictions were less clear for this measure, because there are many possible explanations for considering a group less human. Groups might be seen as less human because they are classified as animals or machines, as in our other measures. But they could also be seen as non-human because they are demonized, depersonalized, or objectified; because they are seen as deviating from the human physical or mental prototype; or because they are attributed superhuman or subhuman levels of skill, power, or other resources (see in general Bain, Vaes, & Leyens, 2014). Nonetheless, we expected that in general, emotions which predicted willingness to use non-human categorical terms would also predict reluctance to use human categorical terms.

In the second study, we added a parallel and novel direct measure of mechanistic dehumanization, using machine-like rather than animal-like categorical terms. Mechanistic dehumanization has not been studied in conjunction with disgust, but is unlikely to be related to disgust specifically because machines are neither intrinsically contaminating nor capable of disgusting behavior. With no basis for disgust, and little intentionality or responsibility from which to derive anger, the main emotion of dehumanization toward a group classified as "machines" might be fear at their threatening potential. We also added measures of appraisals theoretically related

to the relevant emotion, to gain a clearer picture via mediation of whether emotions and dehumanization had any connection independent of appraisals.

In the third study, we added a grid measurement of anger and disgust (Salerno & Peter-Hagene, 2013). We used this measure because prior research indicates very high correlations between anger and disgust, both in our first two studies and other research (e.g., Giner-Sorolla, Kupfer & Sabo, 2018; Gutierrez & Giner-Sorolla, 2007; Russell & Giner-Sorolla, 2011). Additionally, we used a between-subjects design, to see whether the effects could be obtained without explicit comparisons among different groups.

We then conducted a final study in which we manipulated whether a novel group would be seen as intentionally harmful, leading predominantly to anger and fear, or as abnormal and contaminating, leading predominantly to disgust, to test whether the specific emotions are capable of triggering dehumanization in response to these different threat perceptions. We predicted that the two groups would elicit similar levels of dehumanization but would do so because of the different emotions. We predicted that the novel abnormal group would produce dehumanization primarily because of disgust. On the other hand, the novel harmful group would produce dehumanization because of anger and/or fear. For all four studies we report all manipulations, measures, target groups, exclusions, and sample size determination. All of the studies reported in this manuscript received ethical approval from University of Kent's review board.

Study 1 Method
Participants
The study involved 115 participants (25 males, 89 females, and 1 who declined to disclose gender) ranging in age from 18 to 53 (M = 20.78, SD = 4.96). Participants were undergraduate students at the University of Kent in England who were invited to participate in an online questionnaire for partial fulfillment of a course requirement. Sample size was determined as a function of sign-ups and completed questionnaires within a given term period, and finalized prior to data analysis. The sample size was based on a power analysis assuming a small-to-medium f = .15 effect size, a repeated-measures design with .30 correlation among three measures and nonsphericity correction of .90, in which N = 110 would have 80% power.

Materials and Procedure
Based on prior studies among our participant population, we chose three target groups that had been found to primarily elicit anger and/or fear ("terrorists", "politicians who made false expense claims" – a topical scandal in Britain at the time – and "illegal immigrants"), three groups found to primarily elicit disgust ("pedophiles," "the morbidly obese," and "porn directors"), and three groups found to elicit both classes of emotions roughly equally although at different levels ("the BNP" – a far-right party – "chavs" – a derogatory term for working-class people – and "students," the ingroup, generally low in negative

emotions). Incidentally, the groups could also be clustered into comparable levels of overall good/bad evaluation: most negative (terrorists, pedophiles, BNP), moderately negative (politicians, obese, chavs) and close to neutral (illegal immigrants, porn directors, students). However, extremity clustering was for balance purposes only and not examined in our analyses.

After giving informed consent and gender and age demographics, participants filled in repeated measures about each of the nine groups. They were asked how good they thought the group was (1 = *extremely bad*, 7 = *extremely good*) and how likeable they thought the group was (1 = *dislike very much*, 7 = *like very much*), calculating a general evaluation mean from the two variables. Participants filled in emotion scales (1 = *not at all* to 7 = *very much*) asking the extent to which they felt "angry," "disgusted," "afraid," or "contempt" toward the group using single items for each emotion. To help interpret each of the four emotion terms, we illustrated each with a female-poser photograph of that emotion's facial expression, taken from materials validated in Tracy, Robins, and Schriber (2009).

Finally, for each group, dehumanization was measured using the explicit scale developed by Viki et al. (2006, Study 3). For this measure participants were asked to rate how much eight words characterized each social group, using a scale ranging from 1 *not at all* to 7 *very much*. Four of the words had animal connotations (mongrel, creature, beast, and animal); the mean score was used as a measure of the attribution of the *animal* category. Four of the words had human connotations, reverse scored by subtracting the score from 8 (person, humanity, people, and civilian), using the mean as a measure of the *denial of humanity*. Factor analysis (with varimax rotation) confirmed that there were two factors with the appropriate four items in each factor, there were no cross loadings over .27 and all items loaded over .76. Reliability analysis also confirmed that these scales were internally consistent (Animalistic α = .92; Denial of humanity α = .88).

Results
Descriptive statistics for the nine groups are displayed in **Table 1**.[1] The majority of groups elicited equal levels of denial of humanity and animalistic dehumanization, with the exception of illegal immigrants, politicians who make false expenses and students. Overall, we confirmed our pretesting about which groups primarily evoked disgust versus anger. No group elicited primarily fear, and only students (approximately equal on anger vs. disgust) elicited contempt more so than other emotions though at a low level. Anger and disgust were very highly correlated at r = .80, while fear showed appreciable but lower correlations with the two other negative emotions.

Next we examined whether dehumanization (*animal* and *denial of humanity*) was related to anger, disgust, contempt, and fear. We transformed the data so that each case represented a participant's response to each group. The data were then analyzed using a mixed model due

Table 1: Descriptive statistics of dehumanization and emotion variables for Study 2, with overall correlations between variables.

	Animal	Denial Humanity	Evaluation	Anger	Disgust	Fear	Contempt
British National Party	3.52 (1.92)[a]	3.65 (1.62)[a]	2.53 (1.52)	**5.10 (1.78)**	**5.07 (1.99)**	3.12 (1.92)	4.34 (2.09)
Chavs	2.65 (1.51)[a]	2.88 (1.35)[a]	3.18 (1.07)	**3.76 (1.90)**	**3.83 (1.89)**	3.26 (1.74)	3.63 (1.75)
Illegal immigrants	2.07 (1.27)[a]	2.57 (1.20)[b]	3.57 (1.02)	**3.34 (1.81)**	2.70 (1.90)	2.35 (1.57)	2.99 (1.57)
Morbidly obese	2.40 (1.27)[a]	2.44 (1.26)[a]	3.60 (1.03)	3.26 (1.74)	**4.14 (1.85)**	2.36 (1.61)	3.34 (1.85)
Pedophiles	4.67 (1.88)[a]	4.51 (1.81)[a]	1.65 (1.31)	6.16 (1.49)	**6.37 (1.44)**	4.15 (2.12)	4.26 (2.49)
False expenses politicians	2.63 (1.57)[a]	3.17 (1.48)[b]	2.87 (1.02)	**5.01 (1.64)**	4.62 (1.73)	1.99 (1.53)	3.83 (1.99)
Porn directors	2.70 (1.54)[a]	2.74 (1.35)[a]	3.72 (1.09)	2.77 (1.82)	**3.69 (1.99)**	1.74 (1.38)	2.82 (1.73)
Students	2.07 (1.06)[a]	1.80 (0.88)[b]	5.30 (1.07)	2.10 (1.60)	2.18 (1.60)	1.87 (1.42)	**2.96 (1.93)**
Terrorists	4.25 (1.87)[a]	4.49 (1.77)[a]	1.57 (1.10)	**6.20 (1.40)**	5.70 (1.72)	5.34 (1.74)	3.88 (2.40)

Correlation coefficients r	Animal	Denial Humanity	Evaluation	Anger	Disgust	Fear
Denial Humanity	.55		–			
Evaluation	−.42	−.53				
Anger	.53	.46	−.60			
Disgust	.57	.49	−.59	.80		
Fear	.46	.39	−.36	.59	.52	
Contempt	.21	.10	−.21	.38	.23	.37

Note: Means are presented with standard deviations in parentheses. Different subscripts across the dehumanization variables for each group denote statistically different means. Bolded means and SDs indicate the strongest emotion felt toward that group by .10 scale points or more. Only descriptive statistics are given for correlations due to the non-independence of inferential tests within multilevel data. We report correlations across the different groups, rather than within each group.

to the hierarchical nature of the questions (i.e., the same questions were asked of the nine target groups within the higher level structure of participants). We were interested in the general relationships between the emotions and dehumanization at the scenario level, rather than in reporting any participant or Participant × Emotion effects. We included fixed main effects of anger, disgust, fear, contempt and also the random effect of participant grouping, including intercepts for both fixed and random effects. We found that *anger*, *disgust* and *fear* were each unique predictors of both *animalistic* and *denial of humanity* dehumanization; however, contempt was unrelated to animalistic dehumanization and inversely related to the denial of humanity (see **Table 2**). This could be due to methodological issues (i.e. misunderstanding of the term "contempt"; overlap with the term "disgust"), or could indicate that contempt, unlike disgust, is more often used as a social emotion towards other people (Fischer & Giner-Sorolla, 2016), so does not carry overtones of dehumanization. Significance levels remained the same controlling for general evaluation as a covariate, except that the effect of *anger* became only marginally significant when *animalistic dehumanization* was the DV (see **Table 2**).

Study 2

Study 1 provided initial evidence that disgust does not uniquely relate to dehumanization, showing significant contributions from both anger and fear, even controlling for disgust, to both the denial of humanity and the attribution of the animal category. Admittedly, there was a very high correlation between anger and disgust, but when entered simultaneously, both of these emotions as well as fear still contributed independently to predicting both forms of dehumanization. Study 2 extended our investigation by testing whether anger, disgust, and fear were related to mechanistic dehumanization as well as the other two kinds of dehumanization, animal and human denial. Because contempt was unrelated to the attribution of animal words and inversely related to the denial of humanity, it was not included in Study 2.

We also included measures of the appraisals theoretically linked with anger and fear (threat of intentional harm) and disgust (threat of abnormal contamination). By using appraisals as the theoretically specified origin variables in mediation, we could see whether they had distinct connections to the emotions and dehumanization types, and whether emotions and dehumanization showed any relation to each other independently of appraisal, which

Table 2: Emotions predicting dehumanization: Models for Study 1.

DV = Animalistic dehumanization

Intercepts 3846.31		Emotions 3289.44***	Emotions controlling for GE 3274.87***
	Anger	0.10 (0.03), t = 3.18**, CI .04 .16	0.06 (0.03), t = 1.79†, CI −.01 .12
	Disgust	0.30 (0.03), t = 10.53***, CI .24 .36	0.26 (0.03), t = 9.03***, CI .21 .32
	Fear	0.18 (0.02), t = 7.33***, CI .13 .23	0.17 (0.02), t = 6.97***, CI .12 .21
	Contempt	−0.00 (0.02), t = −0.13ns, CI −.05 .04	0.00 (0.02), t = 0.00ns, CI −.04 .04

DV = Denial of humanity

Intercepts 3736.15		Emotions 3200.63***	Emotions controlling for GE 3090.68***
	Anger	0.18 (0.03), t = 6.01***, CI .12 .23	0.08 (0.03), t = 2.90**, CI .03 .14
	Disgust	0.23 (0.03), t = 8.52***, CI .18 .28	0.15 (0.03), t = 5.67***, CI .10 .20
	Fear	0.15 (0.02), t = 6.60***, CI .11 .20	0.13 (0.02), t = 5.90***, CI .09 .17
	Contempt	−0.06 (0.02), t = −3.11**, CI −.10 −.02	−0.06 (0.02), t = −2.99**, CI −.10 −.02

Note: For each model 2 Log Likelihood is presented. Chi Square significance tests were used for comparing models to the intercept only model. For the individual effects parameter estimates are presented with standard errors in parentheses. CI = lower and upper bounds of 95% confidence intervals. GE = General Evaluation. *** $p \le .001$, ** $p \le .005$, * $p < .05$, †$p \le .10$, ns non-significant.

would be a first step in supporting a causal link between appraisal and dehumanization involving emotions.

Method
Participants
This study consisted of 135 students from the same source as Study 1, but a different academic year (28 male, 107 female). Participants were between the ages of 18 to 61 (M = 21.05, SD = 5.22) and sample size was determined following Study 1, with some over-recruitment. As before, all participants were recruited prior to data analysis. This section describes all measures and target groups in the study. There were no exclusions.

Materials, and Procedure
Individuals were invited to complete an online questionnaire. After giving informed consent, participants filled in measures pertaining to five social groups: "terrorists," "pedophiles," "the morbidly obese," "politicians who made false expense claims," and "students." Using the same measures as in Study 1, individuals filled in single measures of emotions (anger, disgust, and fear), general evaluation, and the denial of humanity and attribution of the animal category. Additionally, a novel measure was created to assess Haslam's (2006) concept of mechanistic dehumanization through direct metaphors rather than stereotypical traits, using a similar method as the animalistic dehumanization measure. Individuals were asked to rate how much the following words could be applied to each group: "automatic," "machine," "robot," and "mechanical," using a scale from 1 *not at all* to 7 *very much*. The mean of the four words was calculated as a measure of the attribution of the *machine* category. We performed factor analysis (with varimax rotation), which confirmed that there were three factors with the appropriate four items in each factor, there were no cross loadings over .34 and all items loaded over .71. Reliability

analysis also confirmed that these scales were internally consistent (Animalistic α = .89; Denial of humanity α = .89; Machine α = .95).

We also added measures of appraisals and action tendencies (see Appendix A for full list of items). There were three items that, a priori, we thought would measure perceptions of evilness and three that we thought would measure perceptions of intentional harm; however, these two three-item scales were correlated at r(675) = .87, p < .01, higher than the correlations among other pairs of appraisal scales (which ranged from .32 to .67), and did not form separate factors in rotated factor analyses for most target groups. Thus, we averaged all six of these items into a highly reliable measure, Cronbach α = .95, labeled *desire to harm*. The next variable included two appraisals that assessed power and resources, labeled *power*, r(675) = .61, p < .01. There were three questions which assessed abnormal nature in terms of literal contamination, unnaturalness, and violation of bodily norms, all perceptions associated with feelings of disgust (Rozin, Lowery, Imada & Haidt, 1999; Gutierrez, Giner-Sorolla, & Vasiljevic, 2012). This *abnormality* measure was found to be reliable, Cronbach α = .72.

Additionally, there were five action tendency items, which we had included to measure separate tendencies to punish and avoid the group; however, the two sets of items correlated extremely highly with each other, at r(675) = .84, p < .01, and did not form separate factors, so were combined into a single five-item scale (Cronbach α = .89) labeled *hostile action*. There were also 5 items of *general bad character*, which formed a reliable scale (Cronbach α = .79). Finally, there was a modified version of the *traditional inclusion of other in self* (IOS) measure for each of the social groups, which was adapted from a scale used by Aron, Aron & Smollan, 1992. Although not central to this investigation of dehumanization, all three measures (*IOS, hostile action* and *general bad character*) can be found in the data set.

Results

Descriptive statistics for the five groups are displayed in **Table 3**. As in Study 1, anger and disgust correlated highly ($r = .80$), with lower but still substantial intercorrelations involving fear. Overall the groups elicited varying levels of the different forms of dehumanization.

As in Study 1, the mixed model procedure was used to examine the relationship of dehumanization with anger, disgust, and fear. Replicating Study 1, we found that *disgust, anger*, and *fear* were each significant independent predictors of the *denial of humanity*; significance patterns were the same when general evaluation was controlled for, except that disgust became non-significant, see **Table 4**. We also found that each of the three emotions *disgust, anger*, and *fear* was a significant, independent predictor of the attribution of the *animal* category and levels of significance were the same when general evaluation was controlled for (see **Table 4**). Next we repeated the analysis with the attribution of the *machine* category as the DV; *fear* was the only significant predictor of the *machine* category and this was true whether or not general evaluation was controlled for (see **Table 4**).

Appraisal Analyses

Next we examined the relationships between the theoretically relevant threat appraisals (power, abnormality, desire to harm) and the three emotions. *Desire to harm* was associated with anger, fear, and to a lesser extent disgust; abnormality was related to disgust

and, secondarily, fear; while the power appraisal was associated with anger and fear (see **Table 5**). The relative relationship of each of the three correlated emotions with the appraisal was broadly in line with the theoretical priorities identified in the Introduction.

Mediation Analyses

We examined whether each of the emotions (anger, disgust, fear) could serve as mediators between the appraisals (*desire to harm, abnormality*, and *power*) and the different forms of dehumanization. We performed multilevel mediation analyses using Mplus statistical software version 7.11 (see Preacher, Zhang, & Zyphur, 2011; Preacher, Zyphur, & Zhang, 2010), entering all three appraisals as predictors of a dehumanization DV (either *denial of humanity, animal*, or *machine*), and testing each emotion mediator in separate models, using the significance of the indirect effect through the mediator. All mediation analyses are reported in **Figures 1a–1c**.

With *animal* category attribution as the DV, in each analysis, total effects were significant for both desire to harm and abnormality; however, the total effect for power was marginally or not significant for all three of the emotion mediators. When anger was the mediator its indirect effects for desire to harm and power were both significant; however, both direct effects were still significant, indicating partial mediation. When disgust was the mediator the indirect effects of desire to harm and abnormality were both significant; here too, significant

Table 3: Descriptive statistics of dehumanization and emotion variables for Study 2, with overall correlations between variables.

	Animal	Denial Human	Machine	Eval.	Anger	Disgust	Fear
Terrorists	3.74[a] (1.62)	3.94[a] (1.63)	3.64[a] (1.66)	2.18 (1.51)	5.30 (1.83)	5.04 (1.94)	4.70 (1.81)
Pedophiles	4.31[a] (1.80)	4.09[a] (1.79)	2.88[b] (1.73)	2.14 (1.61)	6.02 (1.58)	6.42 (1.26)	3.71 (2.06)
Morbidly obese	2.08[a] (1.14)	1.86[a] (1.00)	2.46[b] (1.53)	4.19 (1.05)	2.83 (1.66)	3.95 (1.83)	1.82 (1.57)
False expenses politicians	2.54[a] (1.36)	2.99[b] (1.44)	2.59[ab] (1.68)	2.73 (1.19)	5.64 (1.32)	5.16 (1.61)	1.90 (1.38)
Students	1.82[ab] (1.00)	1.65[ab] (0.90)	2.04[a] (1.36)	5.57 (1.13)	1.43 (1.14)	1.40 (1.10)	1.32 (1.00)

Correlation coefficients r	Animal	Denial Humanity	Machine	Evaluation	Anger	Disgust
Denial Humanity	.51					
Machine	.45	.33				
Evaluation	−.32	−.33	−.16			
Anger	.48	.51	.23	−.37		
Disgust	.50	.47	.22	−.46	.80	
Fear	.46	.42	.34	−.36	.53	.46

Note. Means are presented with standard deviations in parentheses. Different subscripts across the dehumanization variables for each group denote statistically different means. Only descriptive statistics are given for correlations due to the non-independence of inferential tests within multilevel data. We report correlations across the different groups, rather than within each group.

Table 4: Emotions predicting dehumanization: Models for Study 2.

DV = Animalistic dehumanization

Intercepts 2605.31		Emotions 2314.51***	Emotions controlling for GE 2310.54***
	Anger	0.11 (0.04), t = 3.21***, CI .04 .18	0.12 (0.04), t = 3.50***, CI .05 .19
	Disgust	0.18 (0.03), t = 5.17***, CI .11 .25	0.15 (0.04), t = 3.99***, CI .07 .22
	Fear	0.21 (0.03), t = 7.34***, CI .15 .26	0.19 (0.03), t = 6.47***, CI .13 .24

DV = Mechanistic dehumanization

Intercepts 2493.32		Emotions 2406.24***	Emotions controlling for GE 2407.48***
	Anger	0.02 (0.04), t = .49ns, CI −.05 .09	0.02 (0.04), t = 0.66ns, CI −.05 .10
	Disgust	0.04 (0.04), t = 1.11ns, CI −.03 .11	0.02 (0.04), t = 0.44ns, CI −.06 .09
	Fear	0.22 (0.03), t = 7.40***, CI .16 .28	0.21 (0.03), t = 6.74***, CI .15 .27

DV = Denial of Humanity

Intercepts 2618.36		Emotions 2310.18***	Emotions controlling for GE 2302.96***
	Anger	0.22 (0.03), t = 6.53***, CI .16 .30	0.24 (0.03), t = 6.88***, CI .17 .30
	Disgust	0.10 (0.03), t = 2.84**, CI .03 .17	0.06 (0.04), t = 1.61ns, CI −.01 .13
	Fear	0.18 (0.03), t = 6.46***, CI .13 .24	0.16 (0.03), t = 5.50***, CI .10 .21

Note: For each model 2 Log Likelihood is presented. Chi Square significance tests were used for comparing models to the intercept only model. Standard errors in parentheses. CI = lower and upper bounds of 95% confidence intervals. GE = General Evaluation. *** $p \le .001$, ** $p \le .005$, * $p < .05$, ns non-significant.

Table 5: Emotions predicting appraisals, Study 2.

DV = Desire Harm

Intercepts 2893.07		Emotions 2341.96***
	Anger	0.29 (0.04), t = 7.50***, CI .21 .36
	Disgust	0.15 (0.04), t = 4.12***, CI .08 .22
	Fear	0.38 (0.03), t = 12.78***, CI .32 .44

DV = Abnormality

Intercepts 2583.41		Emotions 2284.79***
	Anger	−0.05 (0.04), t = −1.29ns, CI −.12 .02
	Disgust	0.34 (0.04), t = 9.59***, CI .27 .41
	Fear	0.22 (0.03), t = 7.64***, CI .16 .28

DV = Power

Intercepts 2536.06		Emotions 2387.59***
	Anger	0.29 (0.04), t = 7.27***, CI .21 .36
	Disgust	−0.06 (0.04), t = −1.49ns, CI −.13 .02
	Fear	0.11 (0.03), t = 3.70***, CI .05 .18

Note: For each model 2 Log Likelihood is presented. Chi Square significance tests were used for comparing models to the intercept only model. For the individual effects parameter estimates are presented with standard errors in parentheses. CI = lower and upper bounds of 95% confidence intervals. *** $p \le .001$, ** $p \le .005$, * $p < .05$, ns non-significant.

direct effects indicated partial mediation. When fear was the mediator none of the indirect effects were found to be significant.

With *denial of humanity* as the DV, total effects were significant for both desire to harm and abnormality; however, the total effect for power was not significant, and this was the case for all three of the emotion mediators. The emotion mediators for the denial of humanity indicated similar indirect and direct effects to the animalistic dehumanization analyses, which suggests that the desire to harm was explained by both anger and disgust, while power was uniquely explained by anger and abnormality was uniquely explained by disgust, again retaining significant direct effects indicative of partial mediation.

When *mechanistic dehumanization* was entered as the DV, total effects were significant for all three of the appraisals and for each of the emotion mediators. For both anger and disgust none of the indirect effects were found to be significant, which indicates that these morally condemning emotions may not able to explain why the appraisals could lead to mechanistic dehumanization. However, when fear was the mediator the indirect effect of desire to harm was significant, in partial mediation given the still-significant direct effect, which suggests that fear may explain part of why the appraisal of desire to harm can lead to mechanistic dehumanization. Also, the indirect effect from the power to machine attributions through fear was marginally significant; again, the direct effect remained significant, so mediation was partial.

Overall, these results supported the general idea that abnormality threat is important for disgust's, but not anger's, relationship to dehumanization, and that fear's special relationship to mechanistic dehumanization has to do with perceptions of harmful desire. The other threat types were less uniquely associated with one kind of emotion. The significance of indirect paths also established that anger and disgust were related to animalistic dehumanization and human nature denial independently from their respective appraisals, and likewise for fear and mechanistic dehumanization. Again, these mediation models should be interpreted cautiously as being compatible with causal models, but not proof of them, because all measures were taken in the same session, unlike an experimental or longitudinal design. To further test claims that mediation paths were distinct,

we compared the coefficients for nonsignificant indirect effects to the 95% confidence interval around significant indirect effects. Where disgust was the only significant mediator (from abnormality), the nonsignificant mediators fell slightly outside its confidence interval (in both humanity denial and animal dehumanization, .00–.04). Where anger was the only significant mediator (from power), the nonsignificant mediators also fell outside its confidence interval (in both humanity denial and animal dehumanization, .00–.04). Where fear was the only significant mediator (from harm to mechanistic dehumanization), the other emotions' indirect effects fell outside its confidence interval (.06–.10).

Figures 1a–c. Mediation models for Study 2, with each emotion mediating between three appraisal predictors and dehumanization, for each type of dehumanization.
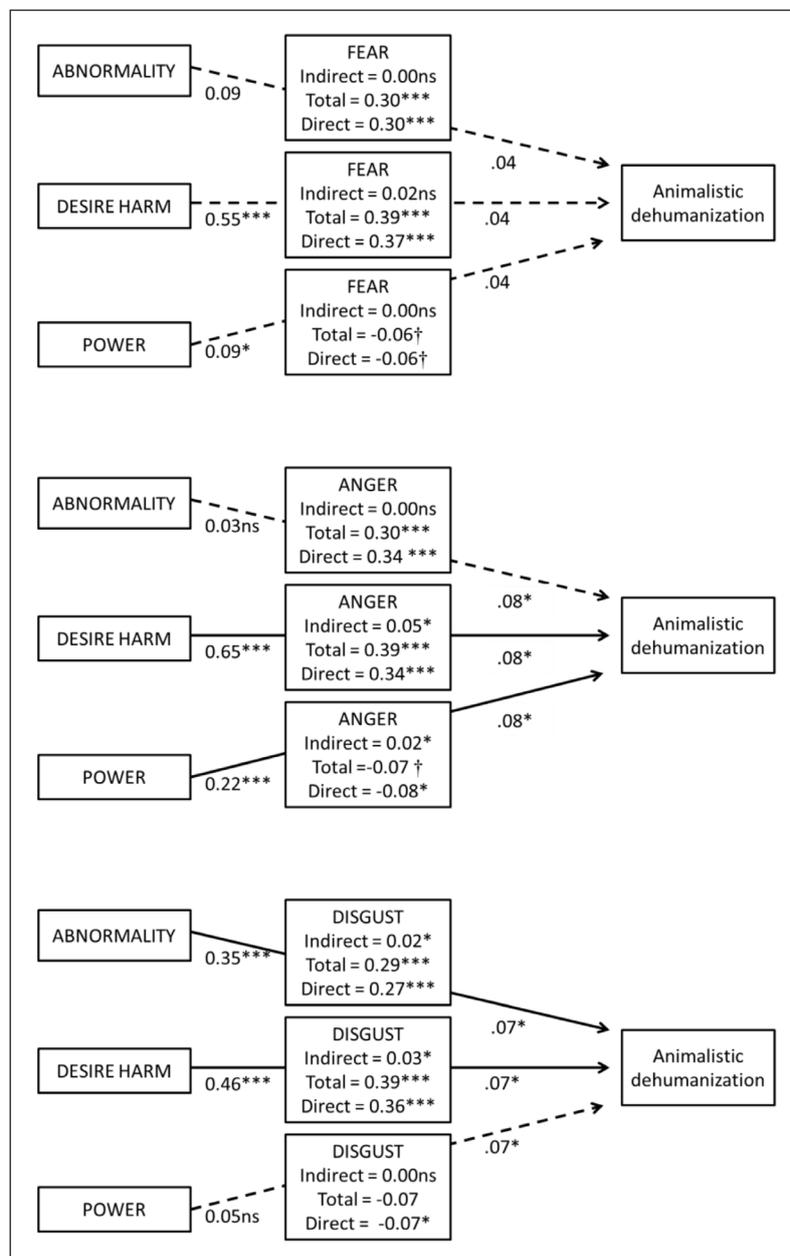
Figure 1a: Models showing mediation between threats and animalistic dehumanization via anger and disgust, not fear.
Note: ***$p \leq .001$, **$p \leq .005$, *$p < .05$, †, $p < .01$, *ns* non-significant.
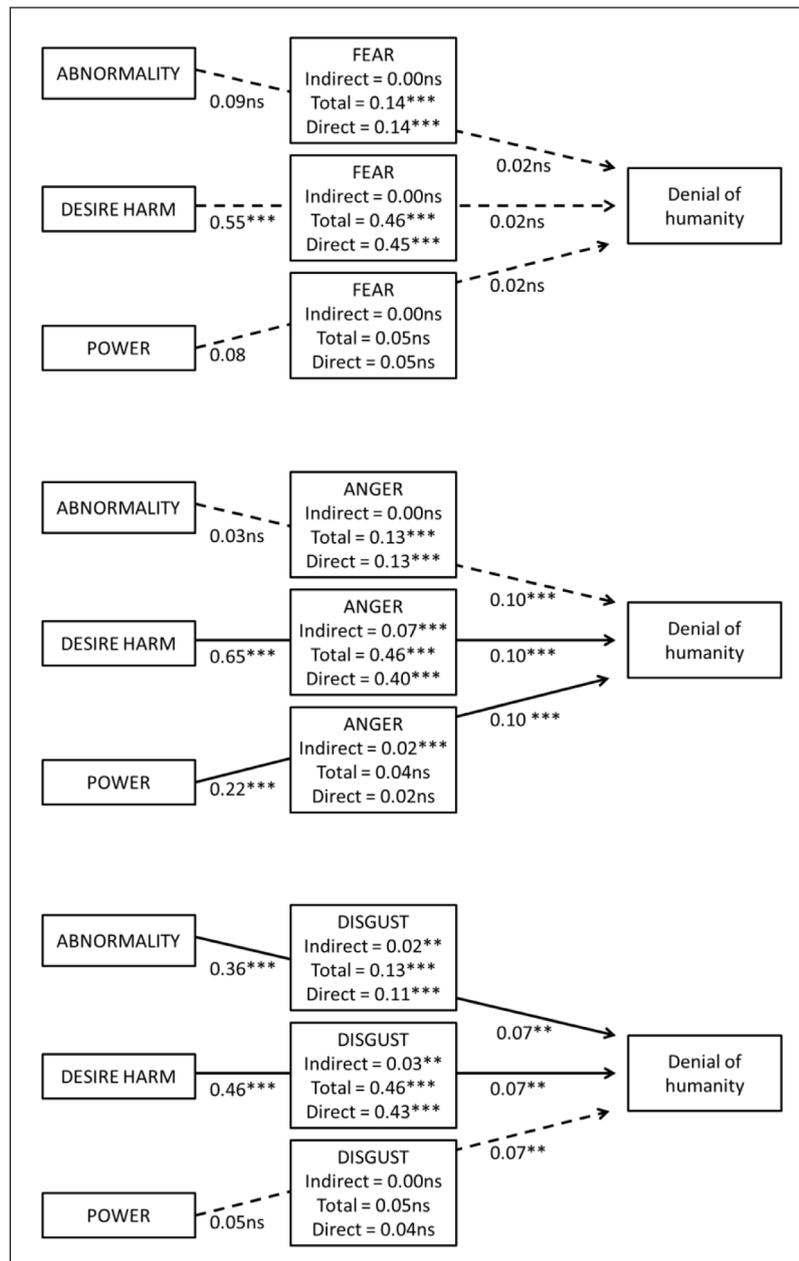
Figure 1b: Models showing mediation between threats and denial of humanity via anger and disgust, not fear.
Note: *** $p \leq .001$, ** $p \leq .005$, * $p < .05$, †, $p < .01$, *ns* non-significant.

Study 3

Study 1 and 2 provided correlational evidence that disgust does not uniquely relate to dehumanization. However, there was a very high correlation between anger and disgust for both studies; therefore, Study 3 focused on these two emotions and added a grid method which could assess both within the same measure (Salerno & Peter-Hagene, 2013). Prior research has shown that this method helps to distinguish between anger and disgust in situations, such as moral judgements, when the two emotions are strongly correlated (Giner-Sorolla, Kupfer & Sabo, 2018). Finally, each participant only evaluated one group in this study, using a between subjects design, in order to avoid explicit comparisons between different groups. We also added short descriptions for each group, for instance, to make clear that when we are referring to the morbidly obese, we are referring to individuals with

a BMI over 40. For this study we used four groups: two that predominantly elicited disgust, and two that elicited anger. Within both group emotion types we had one group that elicited more extreme responses, and another one that elicited less extreme responses. We used these groups based on the results from Studies 1 and 2.

Method

Participants

186 participants were recruited from Prolific Academic, an online crowdsourced work site (for characteristics see Peer, Brandimarte, Samat & Acquisti, 2017). Eight participants were excluded because of giving implausible answers to the demographic questions, leaving 178 participants (106 male, 73 female, 1 did not identify their gender). Participants were between the ages of 17 to 61 ($M = 28.98$, $SD = 7.89$). The majority of the
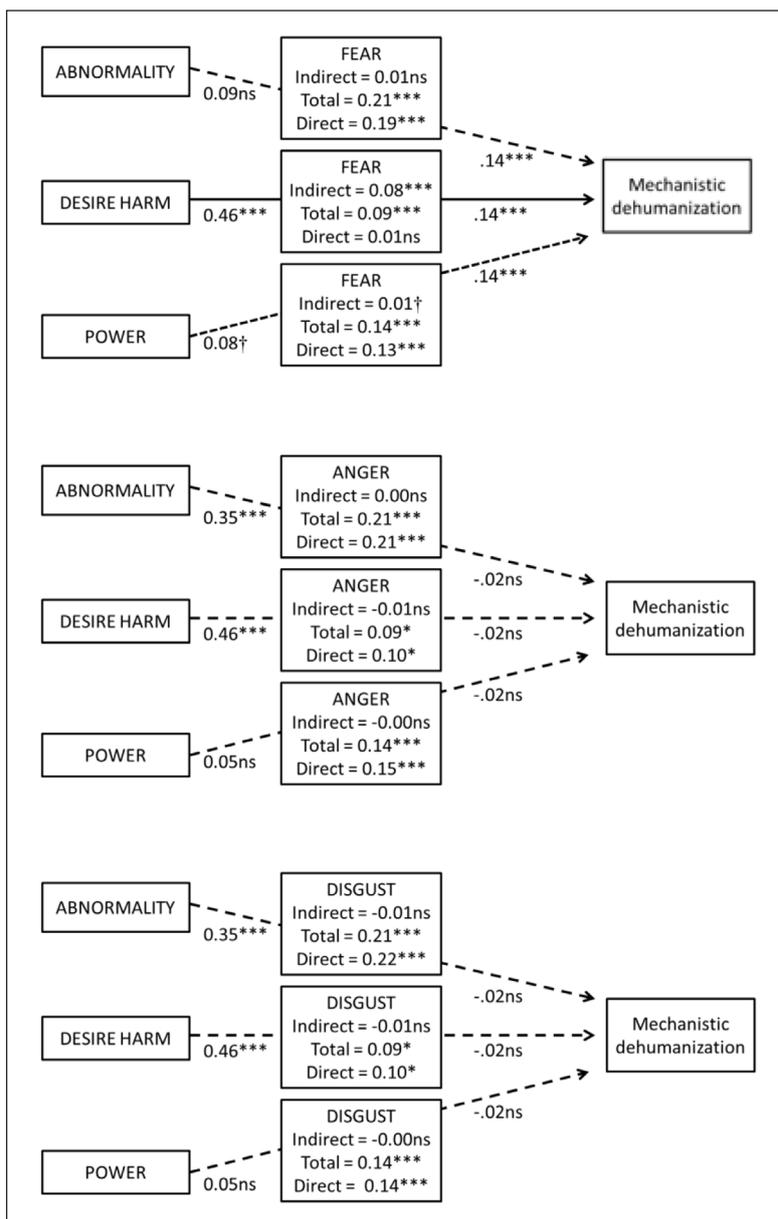
Figure 1c: Models showing mediation between threats and mechanistic dehumanization via fear, not anger and disgust. Note: *** $p \le .001$, ** $p \le .005$, * $p < .05$, †, $p < .01$, *ns* non-significant.

participants were White (64%) and were from European and Asian countries. Participants were provided with reimbursement according to the website's guidelines. Sample size was determined a priori by using power analysis on the basic 2 × 2 × 2 mixed ANOVA model. This indicated that 166 participants could detect a small to medium effect size f = .15 at 90% power, with some over-recruiting to account for excluded participants.

Materials and Procedure
The materials and procedure were similar to the previous studies. However, participants only filled in measures in reaction to one of four groups: extreme or (Anger: terrorists, Disgust: pedophiles), less extreme (Anger: politicians, Disgust: obese). Therefore, the design of the study was based on a 2 (group type emotion: disgust and anger) × 2 (group type severity: extreme and less extreme) between subjects design × 2 repeated measures (anger

and disgust). However, these distinctions were mainly a backdrop for our focal hypothesis, which was the relative strength of disgust and anger responses in predicting dehumanization, tested via multilevel analyses.

To measure emotion we used two methods. First, we used an emotion grid system adapted from Salerno & Peter-Hagene, 2013, that had shown preliminary promise in separating anger from disgust more effectively by asking people to rate the two emotions simultaneously on orthogonal axes of a 5 × 5 matrix. We counterbalanced whether anger or disgust appeared on the x or y axis. We also included an emotion face endorsement measure similar to the other studies. The general evaluation, dehumanization, appraisal and behavioral measures were the same as previous studies. We also included additional hostile action items adapted from Fiske, Cuddy, and Glick (2007) and a wider measure of harm, (see Appendix A), which captures different types of perceived harm, e.g.,

psychological and physical. Similar to previous studies we found our key dehumanization measures to be internally consistent (Animalistic α = .83; Denial of humanity α = .90; Machine α = .93).

Results

Correlations and descriptive statistics for the main variables can be found in **Table 6**. Using the grid measurement we found a lower correlation between anger and disgust.

We performed a 2 (emotion measured: disgust versus anger) × 2 (group type emotion: disgust versus anger) × 2 (group type severity: extreme vs less extreme) mixed model ANOVA to examine the emotions felt towards the different groups. We found a main effect for emotion measured, $F(1,174) = 7.94$, $p = .005$, $\eta^2_p = .04$. Additionally, there was a significant two way interaction between emotion measured and group type emotion, $F(1,174) = 6.58$, $p = .011$, $\eta^2_p = .04$. Pairwise comparisons revealed that the disgust groups elicited more disgust than anger,(Disgust: $M = 4.31$, $SE = .12$; Anger: $M = 3.87$, $SE = .13$, $p < .001$; however, there was no difference in levels of disgust and anger for the anger groups, Disgust: $M = 4.55$, $SE = .12$; Anger: $M = 4.52$, $SE = .13$, $p = .86$. The two way interaction between emotion measured and group type severity, as well as the three way interaction were not found to be significant, both $p > .18$, indicating that severity of group type did not play a role.

We also tested for differences in the dehumanization variables, conducting a 2 (group type emotion: disgust versus anger) × 2 (group type severity: extreme vs less extreme) ANOVA for each of the three dehumanization variables. For both denial of humanity and animalistic dehumanization both main effects and the two way interaction were found to be significant (see **Table 7**). Pairwise comparisons suggested that for denial of humanity and animalistic dehumanization there was a difference in dehumanization levels toward less extreme anger and disgust groups but no difference for the extreme groups, suggesting that participants dehumanized the morbidly obese the least, and dehumanized the other groups fairly equally (see **Table 6** for means). However, for mechanistic dehumanization only the main effect of group type emotion was found to be significant, indicating that participants dehumanized the anger groups more.

We then collapsed across all four groups (i.e., both the emotion and severity factors that discriminated groups), entering both anger and disgust as predictors of animalistic dehumanization in a linear regression model, which revealed anger but not disgust as a significant predictor. This effect was also replicated for the denial of humanity and mechanistic dehumanization dependent variables, see **Table 8**. Additionally, the effects were nearly identical when general evaluation was controlled for, and if we controlled for group type.

Appraisal Analyses

Similar to study 2 we tested the associations between anger and disgust with the appraisals. We found that except for power, the appraisals were predicted by both emotions (see **Table 9**), suggesting that anger was a stronger predictor for each appraisal. Thus, these results do not confirm the appraisal and disgust patterns suggested in the introduction; therefore, further mediation analyses were not conducted.

Table 6: Descriptive statistics of dehumanization and emotion variables for Study 2, with overall correlations between variables.

	Animal	Denial Human	Machine	Eval.	Anger	Disgust
Terrorists	4.71[a] (1.36)	4.57[a] (1.69)	3.93[a] (1.82)	1.91 (1.48)	4.69 (1.01)	4.49 (1.03)
Pedophiles	4.23[a] (1.68)	4.07[a] (2.09)	2.67[b] (1.56)	1.74 (1.36)	4.71 (1.28)	5.16 (0.93)
Morbidly obese	2.61[a] (1.47)	2.81[a] (1.72)	2.40[a] (1.77)	3.69 (1.47)	3.02 (1.51)	3.46 (1.45)
False expenses politicians	4.18[a] (1.33)	4.59[a] (1.41)	3.28[b] (1.43)	2.03 (0.97)	4.36 (1.01)	4.60 (0.99)

Correlation coefficients r	Animal	Denial Humanity	Machine	Evaluation	Anger
Denial Humanity	.23**				
Machine	.65**	.05*ns*			
Evaluation	−.08 *ns*	−.45**	.19**		
Anger	.46**	.38**	.32**	−.36**	
Disgust	.33**	.27**	.20*	−.35**	.64**

Note. Means are presented with standard deviations in parentheses. Different subscripts across the dehumanization variables for each group denote statistically different means. ** $p \leq .01$, * $p < .05$, *ns* non-significant.

Study 4

In our final study, we wanted to show causal relationships manipulating emotions, by presenting different threat types associated with each emotion, and mediation analyses to confirm that each emotion also related to dehumanization independently of the manipulation of threat. Showing such links would also strengthen the explanations for specific emotion-dehumanization correspondences we presented in the Introduction; that is, that harm to the body or rights of others would dehumanize via anger and fear, while social contamination via harmless breaking of sexual norms would dehumanize via disgust. This study presented

Table 7: Group effects on dehumanization variables, Study 3: F-statistics and estimated effect sizes.

Animalistic dehumanization	
Group type Emotion	21.19***, η^2_p = .11
Group type Severity	23.72***, η^2_p = .12
Group type Emotion × Severity	6.12*, η^2_p = .03
Mechanistic dehumanization	
Group type Emotion	18.37***, η^2_p = .09
Group type Severity	3.39†, η^2_p = .02
Group type Emotion × Severity	0.58ns, η^2_p = .00
Denial of humanity	
Group type Emotion	18.64***, η^2_p = .10
Group type Severity	5.55*, η^2_p = .03
Group type Emotion × Severity	5.92*, η^2_p = .03

Note: † $p \le .10$, * $p \le .05$. ** $p \le .01$. *** $p \le .001$.

participants with novel groups with threatening appraisal features linked to different emotions (i.e., causing harm versus violating norms).

Method
Pretest
We established descriptions of novel groups that were similar in terms of disapproval, but different in levels of condemning emotions, through a pre-test. First, we wrote descriptions of seven novel groups (two that posed a literal disease threat, two that violated a bodily norm, two that engaged in harmful action and one neutral control group that engaged in sports as a hobby). Forty pretest participants recruited from Amazon Mechanical Turk (www.mturk.com) filled in items of general evaluation, anger, disgust and fear for each group, using similar measures as previous studies. It was found that the disease groups were evaluated less negatively than the other experimental groups; thus, we focused on selecting one harmful group and one group that violated a bodily norm, labelled as abnormal. One of the abnormal groups (M = 2.07, SD = 0.96) and one of the harmful groups (M = 1.90, SD = 0.86) elicited similar levels of general evaluation $t(39)$ = 1.19, p = .24, and were also seen as significantly less favorable than the control group (M = 5.40, SD = 1.47), both $ps < .001$. Also, the chosen harmful group (M = 5.50, SD = 0.93) elicited greater levels of anger than the chosen abnormal group (M = 4.13, SD = 1.95), $t(39)$ = 4.30, $p < .001$ and the chosen abnormal group (M = 6.05, SD = 1.43) elicited greater levels of disgust than the chosen harmful group (M = 5.05, SD = 1.97), $t(39)$ = 3.87, $p < .001$. No other conditions were included in the experiment. Descriptions of the abnormal, harmful and control groups used in the main study were as follows.

Table 8: Emotions as predictors of dehumanization for Study 3.

DV = Animalistic dehumanization		
	Emotions R^2 = .20, $F(2, 175)$ = 22.02, $p < .001$	**Emotions controlling for GE** R^2 = .21, $F(3, 174)$ = 15.51, $p < .001$
Anger	.40***	.42***
Disgust	.08ns	.09ns
DV = Mechanistic dehumanization		
Intercepts	**Emotions** R^2 = .15, $F(2, 175)$ = 15.39, $p < .001$	**Emotions controlling for GE** R^2 = .26, $F(3, 174)$ = 20.57, $p < .001$
Anger	.36***	.27**
Disgust	.04ns	−.03ns
DV = Denial of Humanity		
Intercepts	**Emotions** R^2 = .11, $F(2, 175)$ = 10.29, $p < .001$	**Emotions controlling for GE** R^2 = .22, $F(3, 174)$ = 16.24, $p < .001$
Anger	.33***	.42***
Disgust	−.01ns	.06ns

Note: For the individual effects standardized gamma (multilevel regression coefficient) is presented. GE = General Evaluation.
*** $p \le .001$, ** $p \le .005$, * $p < .05$, *ns* non-significant.

Table 9: Relationships between Appraisals and Emotions Study 3.

DV = Desire Harm

	Emotions $R^2 = .54$, $F(2, 175) = 102.89$, $p < .001$
Anger	.59***
Disgust	.20**

DV = Abnormality

Intercepts	Emotions $R^2 = .39$, $F(2, 175) = 55.71$, $p < .001$
Anger	.46***
Disgust	.22**

DV = Power

Intercepts	Emotions $R^2 = .11$, $F(2, 175) = 15.99$, $p < .001$
Anger	.39***
Disgust	.00ns

DV = Harm New

Intercepts	Emotions $R^2 = .52$, $F(2, 175) = 93.18$, $p < .001$
Anger	.50***
Disgust	.29***

Note: For the individual effects standardized β is presented. GE = General Evaluation.
*** $p \leq .001$, ** $p \leq .01$, * $p < .05$, ns non-significant.

Abnormal group
Monroes are a group of individuals that have formed a social club/group. They frequently engage in sexual acts with family members, such as their siblings and first cousins. It is believed that they are unlikely to change their sexual behaviors because of the pleasure derived from the acts.

Harmful group
Monroes are a group of individuals that have formed a social club/group. They frequently damage other individuals' property. It is believed that they are unlikely to change their delinquent behaviors because of the satisfaction derived from the acts.

Control group
Monroes are a group of individuals that have formed a social club/group. They frequently engage in athletic behaviors, in terms of they frequently engage in a range of sports. It is believed that they are unlikely to change their sports hobbies.

Participants
We recruited 129 participants; however, only 121 participants completed the study (73 male, 47 female, 1 other). Participants were between the ages of 18 to 66 ($M = 31.36$, $SD = 10.08$). Participants were recruited through Amazon's Mechanical Turk in exchange for payment, 40 cents, and selected for having a 95% HIT approval rate. The ethnicity of the sample was predominately White (42%) and Asian (46%), reflecting Mechanical Turk's worker pool drawn primarily from the United States and India. The sample size was determined before data analysis began, with the aim to recruit 40–45 participants per condition, similar to the per-condition n for study 3 (on the final sample of 121, a sensitivity analysis with similar parameters to study 3 showed that the design could detect a small to medium f = .17 with 80% power).

Materials and Procedure
After agreeing to take part, participants gave their informed consent. They were then randomly assigned to either the harmful, abnormal or control group condition. Participants were then presented with 6 blocks of questions about the novel group (general evaluation, appraisals, action tendencies, dehumanization, emotion faces and emotion word items). Blocks appeared in a random order. General evaluation, appraisals, action tendencies and dehumanization items were measured in the same way as Study 3, except we did not include the additional harm items. Similar to previous studies we found our key dehumanization measures to be internally consistent (Animalistic α = .77; Denial of humanity α = .89; Machine α = .93).

We included both emotion word and facial endorsement ratings. For the emotion face endorsement items we used prototypical anger, disgust and fear faces involving three posers from Beaupré and Hess (2005). We also included emotion word ratings, including synonyms for anger, disgust and fear (see Russell & Giner-Sorolla, 2011). The anger facial endorsement measure (AF) had the highest correlation with the anger word terms variable (AW) in comparison to the disgust words (DW) and fear words (FW), AF–AW = .74, AF–DW = .62, AF–FW = .42, and a scale comprised of the anger facial measure and appropriate words was found to be a reliable scale (Cronbach α = .94), this was also the case for the disgust items (DF–DW = .71, DF–AW = .66, DF–FW = .44, Cronbach α = .93), and the fear items (FF–FW = .61, FF–AW = .32, FF–DW = .27, Cronbach α = .85). Fear, in general, was more distinct from the other two emotions than they were from each other. However, there was enough distinctiveness that we were able to create emotion indices for each of the three emotions averaging the facial response together with each of the verbal responses.

Results
Manipulation Checks
Correlations for the main measures can be found in **Table 10**. Preliminary analyses revealed that the experimental groups (abnormal and harmful) elicited similar levels of disapproval but different, appropriate appraisals; thus, the manipulations were successful (**Table 11**). However, appraisals of power were similar across conditions, $F(2, 118) = 1.42$, $p = .25$, $\eta^2_p = .02$. Overall, the manipulations produced the expected emotions. The harmful group elicited more anger and the

Table 10: Correlations among dehumanization and emotion variables for Study 4.

Correlation coefficients r	Animal	Denial Human	Machine	Anger	Disgust
Denial Human	.41***		–		
Machine	.45***	.11ns			
Anger	.53***	.60***	.18*		
Disgust	.58***	.51***	.16ns	.85***	
Fear	.43***	.43***	.36***	.62***	.59***

Note: *** $p \leq .001$, * $p < .05$, *ns* non-significant.

Table 11: Appraisals and Dehumanization effects for Study 4.

	F Effect	Harmful Group	Abnormal Group	Control Group
General evaluation	44.46***, $\eta^2_p = .44$	2.08[a]	2.42[a]	4.79[b]
Desire harm appraisal	55.95***, $\eta^2_p = .49$	5.72[a]	4.40[b]	2.21[c]
Contamination appraisal	28.11, $\eta^2_p = .32$	4.30[a]	5.25[b]	2.54[c]
Animalistic dehumanization	11.21***, $\eta^2_p = .16$	3.81[a]	4.05[a]	2.58[b]
Denial of humanity	14.36***, $\eta^2_p = .20$	4.36[a]	4.16[a]	2.60[b]
Mechanistic dehumanization	0.21ns, $\eta^2_p = .004$	2.43[a]	2.59[a]	2.68[a]

Note: Different subscripts across the groups denote statistically different means. *** $p \leq .001$, ** $p \leq .005$, * $p < .05$, *ns* non-significant.

Table 12: Emotions effects for Study 4.

Controlling for other emotions

	F Effect	Harmful Group	Abnormal Group	Control Group
Anger	15.87***, $\eta^2_p = .22$	5.59[a]	4.16[b]	4.42[b]
Disgust	27.62***, $\eta^2_p = .32$	4.22[a]	5.75[b]	4.18[a]
Fear	2.35ns, $\eta^2_p = .04$	4.05[a]	3.16[a]	3.90[a]

Without controlling for other emotions

	F Effect	Harmful Group	Abnormal Group	Control Group
Anger	37.11***, $\eta^2_p = .39$	6.21[a]	5.31[a]	2.54[b]
Disgust	43.20***, $\eta^2_p = .42$	5.40[a]	6.19[a]	2.45[b]
Fear	11.20***, $\eta^2_p = .16$	4.67[a]	3.83[a]	2.49[b]

Note: Different subscripts across the groups denote statistically different means. *** $p \leq .001$, ** $p \leq .005$, * $p < .05$, ns non-significant.

abnormal group elicited more disgust, but there was not a significant difference in fear when the other emotions were controlled for (see **Table 12**). In reference to dehumanization, both the abnormal and harmful groups elicited equivalent denial of humanity and animalistic attribution, significantly more than the control group (see **Table 11**).[2] However, the two threatening groups were not perceived differently from control on the machine category (see **Table 9**); thus, no further analysis was conducted on this variable.

Mediation Analyses
Then, we tested whether specific emotions could explain the manipulation-dehumanization effects, via mediation analyses using the PROCESS macro procedure (Hayes, 2013). For each of the mediation analyses, we entered one of the two condition contrasts (Control = 0, Abnormal = 1 or Control = 0, Harmful = 1) as the predictor, one of the emotions (anger, disgust, or fear) as a mediator, with the other two emotions as covariates, and one of the dehumanization measures (animalistic or denial of

humanity) as the dependent variable. This combination of contrast, focal emotion and outcome thus gave us 12 different mediation analyses. We report the analyses with significant indirect paths below, and the other analyses can be found in the Supplementary Materials.

Animalistic dehumanization

When the abnormal/control contrast was entered as the predictor, disgust was a significant mediator of its effect on animalistic dehumanization (see **Figure 2**); however, neither anger (Direct effect 0.44, $p = .44$; Indirect −0.02, 95% CI −.30 .25) nor fear (Direct effect 1.01, $p = .001$; Indirect −0.27, 95% CI −.63 .005) were found to be significant mediators (Total effects = 1.47, $p < .001$). The disgust estimate fell outside the 95% confidence interval for both alternative emotion estimates. On the other hand, when the harmful/control contrast was entered as the predictor, anger was a significant mediator of its effect on animalistic dehumanization (see **Figure 2**), but neither disgust (Direct effect 0.07, $p = .86$; Indirect −0.15, 95% CI −.36 .02) nor fear (Direct effect 0.68, $p = .06$; Indirect 0.07, 95% CI −.19 .39) were significant mediators (Total effects = 1.23, $p < .001$). The anger estimate fell outside the 95% confidence interval for disgust, but not fear.

Denial of humanity

With the abnormal-control contrast as the predictor, disgust was a significant mediator of its effect on the denial of humanity (see **Figure 3**); however, neither anger (Direct effect 0.45, $p = .21$; Indirect −0.02, 95% CI −.31 .32) nor fear (Direct effect 1.17, $p = .001$; Indirect −0.23,

95% CI −.55 −.005) were found to be significant mediators (Total effects = 1.56, $p < .001$). The disgust estimate fell outside the 95% confidence intervals for anger and fear. For the harmful-control contrast, anger was a significant mediator of its effect on the denial of humanity (see **Figure 2**) but neither disgust (Direct effect 0.989, $p = .02$; Indirect 0.10, 95% CI −.27 .009) nor fear (Direct effect 1.29, $p < .001$; Indirect 0.06, 95% CI −.11 .37), were significant mediators (Total effects = 1.76, $p < .001$). The anger estimate fell outside the 95% confidence intervals for disgust, but not fear. Therefore, the mediation analyses demonstrated that anger and disgust differentially explained, in line with our hypotheses, the effects of the two manipulations on both animalistic and humanity-denial dehumanization; while fear did not clearly play such a role, neither could it be distinguished from anger's role.

Discussion

Across four studies we found that not just disgust, but anger and fear were independent predictors of dehumanization (animalistic and denial humanity). This confirms our suspicion that, despite previous research emphasizing disgust's unique role, other hostile emotions also show relationships with dehumanization. The finding that anger and fear are also associated with dehumanization further underscores the importance placed on these emotions in intergroup contexts (Cuddy, Fiske, & Glick, 2007; Cottrell & Neuberg, 2005; Mackie, Devos, & Smith, 2000). While our method does not distinguish between felt emotions in the moment and emotional associations to the group, we believe that the willingness to say that a
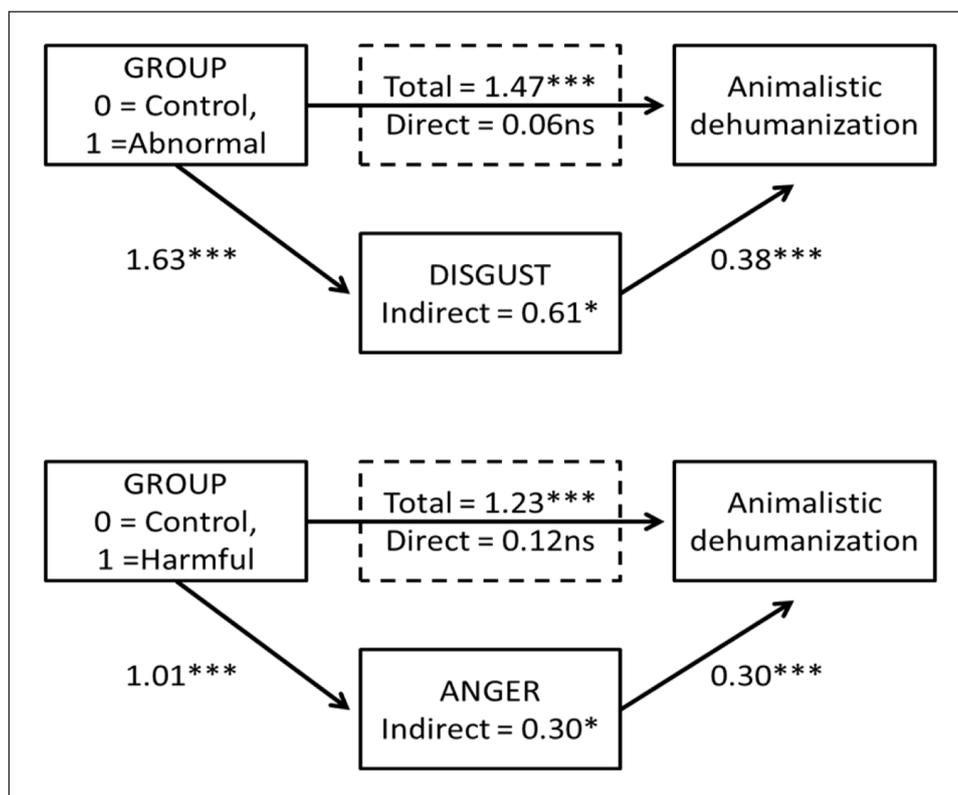
Figure 2: Mediation analyses showing significant indirect effects on the animalistic dehumanization DV, † $p \leq .10$, * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.
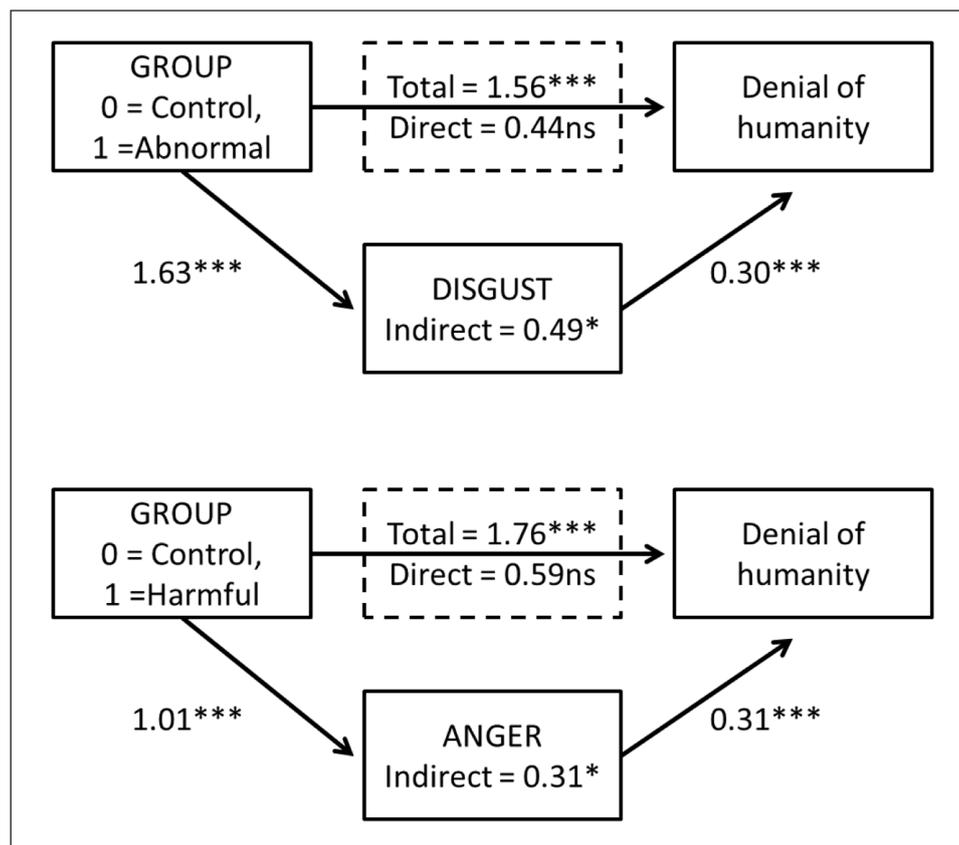
Figure 3: Mediation analyses showing significant indirect effects on the denial of humanity DV, † $p \leq .10$, * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

group makes one feel anger, disgust or fear has its roots in the perception of the group as a threat, forming part of an affective attitude that further conditions action and communication regarding the group.

We recognize that in our studies, anger and disgust were sometimes correlated at a very high level ($r = .80–.85$) which might lead some to question their independence as constructs. However, we found that the residual variance from each emotion could still account independently for some amount of dehumanization in each of our studies. Additionally, in Study 3 we used a grid measurement of anger and disgust, which reduced the correlation between the two emotions, and revealed anger as a stronger predictor of dehumanization. Also, the experimental results from Study 4 corresponded broadly to previous results emphasizing disgust as a response to abnormal stimuli and anger as a response to harmful or threatening stimuli (Russell & Giner-Sorolla, 2013). Moreover, even if anger and disgust had more variance in common than not, our larger point stands: the focus on disgust as a sole factor in dehumanization may not be warranted, if some combination of disgust and anger appears when anger is measured alongside disgust in social contexts.

Haslam (2006) theorized that individuals are likely to feel indifferent toward mechanistically dehumanized individuals; however, to our knowledge, no research since then has tested which emotions accompany this perception. The current research indicates that this form of dehumanization, where it exists, is uniquely captured by feelings of fear, rather than disgust and anger; our Study 4 did not appear to evoke mechanistic dehumanization, mainly because the groups selected displayed threats specific to sentient and biological beings. Apparently there is room to feel afraid of a mechanistically viewed group especially when it is seen as intentionally harming people (the prototype of the robot-soldier comes to mind.) One remaining question is whether mechanistic dehumanization without fear can be evoked by non-threatening groups, such as when low-power groups are seen as cogs in a machine or resources to be exploited. Because very little research has assessed mechanistic dehumanization directly in the manner of Viki et al. (2006, Study 3), more investigation of this kind of prejudicial metaphor may be warranted.

Our measure of animalistic dehumanization yielded interpretable results, further showing that the study of dehumanizing metaphors need not use indirect measures such as assessments of the target group's ability to feel emotions. For the target groups examined, any effects of social desirability that may have existed among our participant samples did not seem to block meaningful variability in applying terms like "animal" and "mongrel" to disliked categories of humans. While animalistic metaphors are a clear and damning expression of dehumanization, and were related consistently both to disgust, anger and fear, the denial of humanity is a more ambiguous process that can possibly respond to many different kinds of thoughts about what the target group actually is, including animal, machine, inanimate, or even demonic metaphors.

Although we repeat our cautions about over-interpreting mediation analysis when mediator and outcome are measured in the same session, the mediation patterns that we tested in Study 2 and 4 are broadly consistent with a model explaining the link between emotion and dehumanization in terms of shared specific threat appraisals that relate both to negative emotions and to dehumanization. In both Study 2 and Study 4, anger mediated between harm threat (manipulated or measured) and animalistic dehumanization as well as denial of humanity. In both Study 2 and Study 4, disgust also mediated between abnormality threat (manipulated or measured) and animalistic dehumanization as well as denial of humanity. Although anger was not involved in the mediation of abnormality, disgust was a mediator between harm and dehumanization in Study 2, but not Study 4. This anomaly may have been due to the less controlled measurement, rather than manipulation, of harm threat in Study 2. However, it should not obscure the overall support for specific patterns of mediation in line with hypotheses about threats and emotions.

In general, our research serves as a caution in the midst of a large and growing body of research preferentially examining disgust as a negative moral and intergroup emotion, sometimes to the exclusion of other candidates – anger in particular (see literature review in Russell & Giner-Sorolla, 2013). Understandably, disgust is a fascinating and intuitively accessible emotion to study. There may also be somewhat of a "man bites dog" appeal to the notion that such a reflexive and earthy reaction plays a part in moral judgment and social attitudes. However, while dehumanization is certainly one prominent outcome of applying disgust to one's fellow human being, researchers should not neglect to follow the trail the other way – from dehumanization back to the various emotions and associated threats that can give rise to it. Among other things, the more complete picture gives more hope that dehumanizing attitudes can be changed, given the apparently greater flexibility of group-based anger compared to disgust (Russell & Giner-Sorolla, 2011a, b; Russell & Giner-Sorolla, 2013).

Data Accessibility Statement
All of the materials and data sets can be found on the Open Science Framework (https://osf.io/p6yaz/?view_only=03b7853991644760a68f7f2400cb8e71).

Appendix A
Full list of Emotion, Appraisal and Action Measures
Anger Words (Study 4)
Angry
Infuriated
Outraged

Fear Words (Study 4)
Fearful
Afraid

Disgust Words (Study 4)
Disgusted
Repulsed
Sickened
Grossedout

Other Emotion Words (Study 4)
Contempt
Compassionate
Pity
Sympathetic

Desire to Harm (Studies 2–4)
X are intentionally threatening.
X are responsible for wrongdoing.
X intentionally cause others harm.
X are evil.
X are malicious.
X are sadistic.

Additional Harm items for Study 3
X cause psychological harm to other individuals.
X cause physical harm to other individuals.
X cause emotional harm to other individuals.
X violate the rights of other individuals.
X cause harm to society at large.

Contamination (Studies 2–4)
X are unnatural.
X do strange things with their bodies.
X contaminate those around them.

Power (Studies 2–4)
X are more powerful than the rest of us.
The rest of us are incapable of coping with the threat posed by X.

Bad Character (Studies 2–4)
X are unpredictable.
X are unable to change their behavior.
X do not want to change.
X commit immoral acts.
X are just naturally bad.

Hostile Action (Studies 2–4)
X deserve to be punished.
I would like to attack X.
I would like to escape from X.
I would like to avoid X.
I would like to see X exterminated.

Hostile Action additional items for Study 3 and 4
Say bad things about them when they're not around
Exclude them from the rest of society
Stop them from getting what they want
Say bad things about them to their face
Get into a fight with them
Violently attack them
Disrupt their activities
Escape from them
Avoid them when you can

Get rid of them
Punish them for their actions

Positive Action items for Study 3 and 4 (filler items)
Lend a hand to them
Join forces with them
Associate with them
Cooperate with them
Protect them from harm

Note: "X" was replaced with the label of one of the five social groups in Study 2 and 3 or Monroes in Study 4.

Notes
[1] For 29 participants the questions pertaining to morbidly obese were labelled incorrectly, thus were omitted from the analyses.
[2] Because of reviewer concerns about the possible influence of more negative words in the animalistic measure, (i.e., civilian, mongrel and beast).

Competing Interests
The authors have no competing interests to declare.

Author Contributions
· Contributed to conception and design of Experiments 1 and 2: RGS
· Contributed to conception and design of Experiments 3 and 4: RGS, PSR
· Contributed to acquisition of data of Experiments 1 and 2: RGS
· Contributed to acquisition of data of Experiments 3 and 4: PSR
· Contributed to analysis and interpretation of data (Experiments 1–4): RGS, PSR
· Drafted and/or revised the article: RGS, PSR
· Approved the submitted version for publication: RGS, PSR

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