Just an Anger Synonym? Moral Context Influences Predictors of Disgust Word Use.

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Abstract

Do verbal reports of disgust in moral situations correspond to the concept of disgust as measured by other means, or are they used metaphorically to refer to anger? In this experiment, participants read scenarios describing a violation of a norm either about the use of the body (bodily-moral) or about harm and rights (socio-moral). They then expressed disgust and anger on verbal scales, and alternate representations of these emotion concepts were assessed through facial expression endorsement measures. When socio-moral norms were violated, anger words strongly predicted disgust words, and the separate role of disgust face endorsement was low, although significant. When bodily norms were violated, the predictive role of anger words roughly equaled the role of disgust face endorsements. Angry faces, however, never predicted disgust words independently of anger words. These results support a middle ground position in which disgust words concerning socio-moral violations are not entirely a metaphor for anger and bear some relationship to other representations of disgust. At the same time, however, the use of disgust language is more strongly related to anger language, and less strongly related to facial representations of disgust, for socio-moral versus bodily-moral violations.

Recently, the emotion of disgust has been identified as a factor in moral judgment. Hypnotic suggestions to feel disgust have been shown to lead to harsher moral judgments (Wheatley & Haidt, 2005), as have subtle environmental inductions of disgust (Schnall, Haidt, Clore & Jordan, 2008). The individual difference of disgust sensitivity predicts negative judgments of criminals (Jones & Fitness, 2008) and sexual minorities (Olatunji, 2008), while outgroups that threaten values also elicit disgust (Cottrell & Neuberg, 2005). Neurologically, brain centers involved in disgust are also implicated in a number of moral judgment tasks (e.g., Moll et al. 2005; Schaich Borg, Lieberman & Kiehl, 2008). Drawing on this literature, some philosophers and psychologists have seen strong support for accounts of morality based on emotional reactions (Haidt, 2001; Prinz, 2007)

While disgust may serve as a general input to heightened moral sensitivity, some moral judgments may be more prone to involve different hostile moral emotions, such as anger. The CAD hypothesis states that each emotion of the moral hostility triad – contempt, anger, and disgust – responds to a specific form of moral violation (Rozin, Lowery, Imada & Haidt, 1999). While contempt responds to violations of community ethics (duties and obligations based on social roles), anger responds to violations of autonomy ethics (concerns with harm and rights) and disgust, to violations of divinity ethics (concerns with purity and use of the body). At the same time, some of the same authors have proposed that disgust can have socio-moral functions beyond the realms of purity and the body. For example, Haidt, Rozin, McCauley and Imada (1997) interviewed people in different cultural and linguistic settings about the term most closely corresponding to "disgust" and found that people nominated non-bodily socio-moral transgressions as disgusting. However, exactly which transgressions were disgusting varied between cultures; for example, Americans found racism and senseless murder

disgusting, while Japanese people found the irritating behavior of others disgusting, as well as their own personal failings.

To clarify, it is helpful to think of three possible kinds of context that can elicit disgust words – including synonyms such as "repulsed" or "sickened." The first, *basic disgust*, involves the body but not morality. It includes categories such as core disgust towards disease cues and death. The second, *bodily-moral disgust*, involves people's violations of norms that regulate people's use of the body. It includes disgust felt at violations of sexual norms (incest, homosexuality), dietary norms (in particular, those surrounding what animals and animal parts should be eaten), and norms about the modification of the body (for example, human cloning or body piercing). Although it might be argued whether such body-relevant norms involve morality, or just cultural mores, there is evidence that violating them can be seen as "wrong" and not just disgusting in Western middle-class society (Haidt & Hersh, 2001; Gutierrez & Giner-Sorolla, 2007) and that an even wider range of body-relevant norms is moralized among other cultural and class backgrounds (Haidt, Koller, & Dias, 1993). The third, *socio-moral disgust*, involves morality but not necessarily the body itself. It includes activities that Miller (1997) classifies as "despicable," for example, betrayal, dishonesty, or exploitation, as well as things like racism or sadism. A key component of these socio-moral elicitors of disgust is that they involve the violation of certain classes of rights, such as trust or equal treatment.

Unfortunately, not all research on moral disgust has effectively separated basic, bodily-moral and socio-moral elicitors. For example, Moll et al. (2005) showed overlap between basic ("pure") disgust and moral indignation, but many of the moral indignation stories involved elements of basic disgust such as cockroaches on someone's face or rats in cooking pans. Although Marzillier and Davey (2004) found in a cluster analysis that bodily-moral and socio-moral disgust elicitors loaded together separately from more basic disgust elicitors, there is also evidence that bodily-moral disgust involves reactions that are typical of disgust rather than anger, and evident through other means than language. Royzman, Leeman and Sabini (2008) found that descriptions of sibling incest led to reports of physiological experiences characteristic of disgust but not anger, such as nausea and loss of appetite. Gutierrez and Giner-Sorolla (2007) varied scenarios according to their violation of bodily-moral taboos and socio-moral norms (betrayal) and found that controlling for anger, disgust was only predicted by bodily-moral violations. In addition, in a brain imaging study, Schaich Borg, Lieberman and Kiehl (2008) found evidence for the separateness as well as similarity of reactions to basic ("pathogen-related"), bodily-moral (incest) and socio-moral disgust stimuli – although their results left less clear whether differences in activation of various brain regions, particularly the insula, were found on the basis of differences in emotional experience, or because of other factors.

When a person reports "socio-moral disgust" at bigoted, deceptive, or harmful behavior – in other words, at violations of various rights – the question remains whether this is only a peculiarity of the lexicon, or whether the concept of disgust also extends to other representations of emotions. Perhaps the person who is "disgusted" at Nazi marches or thieving bankers is actually reporting an emotion that they would characterize by choosing a facial expression of anger, and that has other cognitive and action components more characteristic of anger (cf. Royzman & Sabini, 2001; Bloom, 2004).

Supporting this prediction, studies of the lexicon of emotions in English often find that people refer to disgust as a form of anger, or as a sub-category of anger (Alvarado, 1998; Shaver, Schwartz, Kirson & O'Connor, 1987). Nabi (2002) asked college undergraduate participants about the use of the term "disgust" and found that they described situations that better characterised anger, as opposed to the slang term "grossed out" which was reserved for episodes violating bodily norms. In a similar manner, Rozin, Haidt and McCauley (1999) reported that when participants were requested to list episodes in which they felt disgust, participants commonly retrieved episodes that theoretically elicit anger. However, to say just on that basis that those participants really felt anger would rest on somewhat circular reasoning. Specifically, if a student uses the word "disgusting" to upbraid a roommate damaging property, an act that in theory should only lead to anger, perhaps it is the theory and not the student that is mistaken. Evidence for this *anger-synonym* position would be more conclusive, then, if a context were found in which disgust language was related primarily to anger language or to other representations of anger such as endorsement of facial expressions, rather than to other representations of disgust.

Another possibility is that socio-moral disgust, beyond the verbal label, does share important representational characteristics with disgust felt in non-moral contexts. Supporting this conclusion, Danovitch and Bloom (2009) report studies in which young children not only apply the verbal label of "disgust" to non-physical moral violations, but also associate these violations with a picture of a disgusted face, although to a lesser extent than they associated core disgust violations with the face. While suggestive, these studies did not offer an alternative negative choice such as an angry face; it is possible that children were attempting to provide a satisfactory answer on the basis of general negative feelings, for example. In a more direct approach to these questions, Simpson, Carter, Anthony and Overton (2006) compared the characteristics of disgust in basic versus socio-moral contexts (but importantly, not bodily-moral contexts) using photographic stimuli. Of greatest importance to our concerns, their analysis found anger language to be a large and significant predictor of disgust language in socio-moral but not core disgust settings. In fact, a model with anger as the only significant variable predicted 67% of variance in socio-moral disgust. This left unclear whether socio-moral disgust is a form of anger or just covaries closely with anger – again, because no separate assessment of emotional representations was included.

Tying together the existing, partial findings in the literature, it seems that the context in which moral disgust is elicited might make a difference. When disgust responds to socio-moral violations of rights that do not involve norms about the use of the body, existing research suggests that the use of disgust language will be strongly related to anger language. When disgust responds to bodily-moral violations, however, existing research (e.g., on responses to violations of the incest

taboo) suggests that disgust language will be less related to anger language and more related to other representations of disgust, such as endorsement of facial expressions. The purpose of this study, therefore, is to test these predictions about context directly, by varying similar scenarios to refer to either a socio-moral or a bodily-moral violation, and assessing participants' self-reported emotions through vocabulary as well as endorsement of facial expressions.

Present Research

This research examined the effects of moral context on the use of words related to the emotions of anger and disgust. We used endorsement of pictures of facial expressions as an alternate representation of these emotions. We chose facial expression endorsement (e.g., Rozin et al., 1999) as a measure of emotion concept distinct from endorsement of vocabulary words. It is true that categorization of faces as feeling specific emotions has been shown to involve the corresponding language concepts (Roberson & Davidoff, 2000; Lindquist, Barrett, Bliss-Moreau & Russell, 2006), and so cannot be said to be completely language-free. But evidence from preliminary studies in our lab led us to believe that a scaled measure of facial expression endorsement was not completely redundant with endorsement of verbal terms, contributing at least some independent variance to the representation of an emotional state. Specifically, in a reanalysis of conditions from Gutierrez and Giner-Sorolla (2007) that distinctly represented bodily-moral and socio-moral violations, disgust face endorsement (controlling for anger face and anger word endorsement) significantly predicted disgust word endorsement only in bodily-moral violation conditions. This led us to believe that facial endorsement measures would be helpful in testing hypotheses about whether the application of disgust synonyms to a socio-moral violation reflected a situation in which the literal use of language was not accompanied by other aspects of the disgust representation.

In contexts where the word "disgust" and its synonyms are predicted strongly by disgusted facial expressions, there is more of a case that the language is being used to express the emotion of disgust, as distinct from anger. However, to the extent that anger language or anger faces emerge as a stronger predictor of disgust words, there would be more of a case that the verbal "disgust" expressed in that context is being used as a synonym for anger.

We expected that anger would be a relatively stronger predictor of disgust word endorsement in contexts involving socio-moral violations that did not involve violating norms about the use of the body per se. We also expected that disgust faces would more strongly predict disgust words, independently of anger words and faces, in contexts where norms about the use of the body were violated without harming other people's rights in a socio-moral sense. These predictions were tested in our study by crossing the context condition with the continuous effect of each predictor – anger words, anger faces, disgust faces – on disgust word use, and looking for moderating effects of condition on the effect of each predictor.

We tested these hypotheses with an experiment varying the bodily-moral or socio-moral nature of scenarios that represented violations of norms about sexuality, eating, or body modification. Participants were presented with one of two variations of each scenario in which a moral norm was violated, one involving a *bodily-moral* action which violated a norm about the use of the body without harming another person, and the other involving *socio-moral* action against another person without violating a body-relevant norm. The pairing of the particular setting with socio-moral or bodily-moral violations was counterbalanced across participants.

We made predictions in line with our preferred theory: when the moral transgression does not violate a bodily norm, "disgust" and its synonyms refer to a more anger-like state. Thus, participants should adapt their use of disgust words to different contexts. In bodily-moral conditions, disgust words should be associated most strongly with endorsement of disgust facial expressions. In socio-moral conditions, however, we expected a weaker association of disgust words with disgust facial expressions, and a stronger association with anger – either in the form of words or facial expressions.

Method

Participants

Participants were undergraduate students (56 females and 8 males, 4 participants did not specify their gender) who participated on a voluntary basis in exchange for monetary reimbursement (£2 per participant) or partial course credit at a university in the Southeast of England (mean age 21.16, *SD* = 6.27).

Design

The factors of interest in the experiment represented a 2 (Condition: Socio-moral vs. Bodily-moral, within participants) x 2 (Story pair counterbalancing: Sexual relationship and meat substitute, vs. cloned steak and body modification, between participants) x 2 (Counterbalancing factor determining which story in each pair represented each condition, between participants) design. Different stories were assigned to different violation types in a counterbalanced manner, so that participants did not encounter the same story setting twice, and each story was presented for some participants in the socio-moral version and for others in the bodily-moral version. Overall, condition was the main factor of interest in the analysis.

Materials

The four story settings (Appendix), each of which could be presented as involving either a bodily-moral or socio-moral violation, were combined to create different versions of the questionnaire. The versions involved different combinations of story/moral violation, so that each questionnaire contained one story in which a bodily-moral violation but no harm was described, and a story with a different setting in which a socio-moral violation was described. In socio-moral versions of the scenario, the actions of the main character of the story violated someone else's rights, deceiving or coercing the other person into eating something, having sex, or getting a socially accepted body modification, (i.e., a tattoo). But, in those versions, the character did not violate a norm about eating, body modification

or sexual conduct per se. In bodily-moral versions of the scenarios, by contrast, the main character violated a norm about the use of the body without violating anyone's rights (consenting to eat vulture meat or artificially created human flesh; two adults having sex across an extreme age difference; voluntarily getting a decorative scarification), but did not harm anyone else in the process.

The assignment of which story represented socio-moral violations and which represented bodily-moral violations, as well as the order of the two violation types and the order of presentation of the face and word emotion measures, were all counterbalanced between participants, resulting in sixteen versions of the questionnaire. Participants were randomly assigned to read either the "meat substitute" and "sexual relationship" scenarios or the "cloned steak" and "body modification" scenarios.

Word emotion measures. The questionnaire asked participants to indicate to what extent the story made them feel anger, disgust, infuriation, outrage, pity, repulsion, sadness, sickness, sorrow, sympathy, and contempt toward the main actor in the story. These items were answered on a scale from 1 (Not at all) to 8 (Very).

Facial emotion measures. Each participant saw two sets of photographs from the MFSDE set of emotional facial expressions (Beaupré, Cheung, & Hess, 2000), each showing three female posers (one Asian, one Black, and one White) with each picture measuring 27.3 mm x 38.9 mm. One set expressed anger and the other expressed disgust. All expressions were at 100% intensity[1]. Participants were first asked to "Select one set of faces that best describes your feelings about the story." Then they were asked to indicate for both sets of faces, on scales from 1 (not at all) to 9 (Extremely), "How much of this feeling do you have at this point towards [the main character of the story]?"

Procedure

All participants were tested individually. After providing consent, they were presented with demographic measures (age and gender), followed by one of the scenarios. Participants were asked to read the scenario carefully and answered the word emotion measures, as well as the facial emotion measures. The second scenario and identical measures were presented after that. After completing the questionnaire, participants were thanked and debriefed.

Results

Verbal Emotion Measures

Four indices were created averaging endorsement of words related to the emotions of anger (anger, infuriation and outraged; Cronbach's $\alpha = .93$); disgust (disgust, repulsion, and sickness; Cronbach's $\alpha = .94$); sadness (sadness, sorrow; Cronbach's $\alpha = .78$, $r\,(133) = .67$, $p < .001$) and pity (pity and sympathy; Cronbach's $\alpha = .63$, $r\,(133) = .46$, $p < .001$). A mixed model analysis of variance showed a significant main effect of Emotion $F\,(3, 399) = 44.94$, MSE = 2.34, $p < .001$; a non-significant main effect of Condition, $F\,(1, 133) = .90$, MSE = 7.97, $p = .35$; but a significant interaction between these factors $F\,(3, 399) = 14.35$, MSE = 2.34, $p < .001$. There was significantly more anger than the other emotions in socio-moral vs. bodily-moral scenarios and significantly more disgust than the other emotions in bodily-moral vs. socio-moral scenarios. Importantly, this analysis also revealed significantly lower levels of sadness and pity than anger (all $t > 2.95$, all $p < .01$) and disgust (all $t > 2.65$, all $p < .01$) in both conditions, as well as no significant differences between sadness and pity in any of the conditions (all $t < .33$, all $p > .74$). Sadness and pity were not affected by the manipulation of social vs. moral violations (Table 1).

Table 1. Mean and standard deviations of measures.

	Condition	
	Socio-moral	Bodily-moral
Anger words	4.58 (2.28)a	3.46 (1.83)b
Disgust words	4.15 (2.28)a	5.35 (2.07)b
Sadness words	3.22 (1.84)a	2.66 (1.58)a
Pity words	3.16 (1.93)a	2.73 (1.56)a
Contempt words	3.16 (1.98)a	2.38 (1.33)b
Selection anger face	46 (73%)a	17 (27%)b
Selection disgust face	21 (29%)a	51 (71%)b
Scale rating, anger face	5.72 (2.19)a	4.56 (2.18)b
Scale rating, disgust face	4.72 (2.72)a	6.33 (2.27)b

Note: Standard deviations are in parentheses. Means in the same

[1] Because more than one set of expressive elements can lead to a facial expression being perceived as angry or disgusted, it is important to examine the component action units (AU) of our stimuli according to the Facial Affect Coding System (FACS; Ekman & Rosenberg, 2005). In development of the MFSDE, posers were trained to activate specific key action units for each expression, which were then verified by two coders; expressions that were not successfully identified by both coders were not used (Hess, personal communication, 2010). The target AUs for anger were 4, 5b and 23, respectively showing wrinkled/lowered brow, slightly raised eyelids, and tightened lips; the target AUs for disgust were 9d and 25, respectively showing wrinkled nose and parted lips (in all three disgust faces the teeth were visible). Although action unit 10, upper lip raise, is an expression common to a number of disgust contexts including violations of the body's integrity, of body-related morality, and of personal contamination, it is also characteristic of angry expressions (Rozin, Lowery & Ebert, 1994). The MFSDE posers were not instructed to include AU10, possibly because it did not distinguish between anger and disgust. Thus, the expressions of anger (furrowed brow, tightened lips) and disgust (raised nose, loose and parted lips with only upper teeth visible) were intended to be distinctive, avoiding confusion from inclusion of the ambiguous AU10 in both expressions.

row with different subscripts are significantly different by t-test or contingency coefficient at $p < .01$.

Our main theoretical focus was on anger and disgust, rather than contempt. Because the correspondence between word and face measures of emotion was a crucial part of the study, findings of non-correspondence between use of the "contempt" verbal label and identification of contempt faces (e.g., Matsumoto & Ekman, 2004) dissuaded us from including contempt as a fully represented moral emotion. However, for exploratory purposes we analyzed the single-word measure, "contempt." The "contempt" word was endorsed less strongly than anger and disgust language; that is, to about the same extent as the sadness and pity terms. It was endorsed more strongly in socio-moral violations than bodily-moral violations; a regression analysis predicting "contempt" endorsement from anger and disgust words and faces, too, found that only anger words significantly predicted it in the socio-moral condition ($\beta = .87$, $p < .001$), while none of the four anger and disgust indicators predicted it significantly in the bodily-moral condition. Thus, the word "contempt" appeared to more strongly characterize socio-moral than bodily-moral violations, and was closely related to anger language.

Facial Measures of Emotions

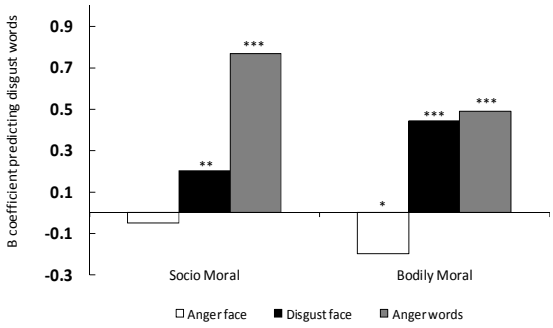
Analysis of variance of the scores of the faces representing anger and disgust revealed non-significant main effects of Emotion, F (1, 122) = 2.28, MSE = 4.11, $p = .13$; and Condition, F (1, 122) = 0.45, MSE = 6.91, $p = .51$. These main effects were qualified by a significant interaction, F (1, 133) = 29.09, MSE = 4.10, $p < .001$, indicating more anger in the socio-moral condition and more disgust in the bodily-moral condition (**Error! Reference source not found.**). Finally, the forced choice of the faces representing anger and disgust showed that across the four stories the faces representing anger were selected more in the socio-moral condition. Conversely, the faces showing disgust were selected more in the bodily-moral condition, χ^2 (1) = 25.84, $p < .001$ (Table 1).

Relationship between words and facial expressions

The relationship between the words and facial expressions of both emotions was analysed using a multilevel approach with SPSS MIXED analyses. The participant number was entered as a random effect. The dependent variable was either mean endorsement of anger terms or disgust terms. Scores for facial expression endorsement for each emotion, as well as the mean endorsement of verbal terms for the other emotion, were entered as covariate predictors. The condition – socio-moral (1) vs. bodily-moral (-1) – was coded and entered as a main effect, and also used to generate interactions with each of the three covariate predictors.

We found a significant main effect of Condition, B = -1.82, SE = .68, $p = .009$, indicating that disgust words were endorsed more in the bodily-moral condition than in the socio-moral condition. We also found significant main effects of anger words, B = 0.75, SE = .10, $p < .001$; and disgust faces, B = 0.21, SE = .08, $p = .008$; as well as a non-significant main effect of anger faces, B = -0.05, SE = .08, $p = .52$. A significant Condition x Disgust Faces interaction was present, B = 0.22, SE = .11, $p = .04$; as well as a marginal Condition x Anger Words interaction, B = -0.25, SE = .13, $p = .06$. The Condition x Anger Faces interaction was not significant, B = -0.15, SE = .11, $p = .16$. These interactions reflect the evident differences between predictors of disgust word use in the socio-moral and bodily-moral conditions (Figure 1). That is, the use of disgust words in the socio-moral condition was largely predicted by anger words and only secondarily by disgust faces, whereas in the bodily-moral condition the use of disgust words was predicted to a similar extent by disgust faces and anger words[2].

Figure 1. Anger and disgust facial endorsement, and anger word endorsement, as predictors of disgust word endorsement in socio-moral and bodily-moral contexts. Note: * = p < .05, ** = p < .01, *** = p < .001.



General Discussion

In this experiment, the relationship of disgust vocabulary to a facial endorsement indicator of disgust, independently of anger language, was affected by the type of moral violation described. In a situation where someone was harmed, but taboos about the body were not violated, endorsement of disgust words was predicted primarily by the use of anger words, and only to a lesser extent by endorsement of disgust faces. However, in a situation where no actual harm was done but bodily-moral taboos were violated (e.g., an unusual but consensual sex act), disgust words were predicted about equally by anger words and by endorsement of disgusted faces. This evidence argues that moral disgust language is more strongly related to other representations of the disgust concept when its context is bodily-moral (e.g., sexual, body use, and food taboo violations), rather than non-bodily and socio-moral (e.g., harm, deception, or rights violation).

A more difficult question is what this means for disgust as a moral emotion. Our results for harm-only (socio-moral) scenarios imply that in those situations, when someone says they are "disgusted" at unfairness, exploitation, or rights violation, the use of these disgust words has largely to do with

[2] A similar analysis adding the Sadness and Pity word indexes as predictors revealed a very similar pattern to the one presented. The indexes of sadness and pity words did not produce any significant main effects (all B < .12, all $p > .30$) and they did not interact with any of the other variables (all B < .06, all $p > .73$).

the use of related anger vocabulary. However, some caveats must also be observed when evaluating the strong position that the use of disgust language in socio-moral violations is *only* a metaphorical way to characterize anger. First, the use of disgust words was never predicted independently by endorsement of anger faces, controlling for anger words. And, the independent influence of disgust faces on disgust words still stayed significant in socio-moral conditions, even though it was greatly reduced in magnitude. Thus, verbal expressions of disgust in socio-moral violations still show some small correspondence to non-verbal representations of the disgust emotion, while showing a relatively stronger semantic link to anger words (cf. Simpson et al., 2006). This link may explain the considerable semantic overlap between disgust and anger vocabulary in English; for example, in Russell and Fehr (1994), about two thirds of participants volunteered "disgusted" as a synonym for "angry". Perhaps they were thinking primarily of socio-moral contexts when they did this. A third and overarching caution is that overall, disgust and anger tend to be correlated and in fact confused emotions, not just in terms of the lexicon, but also when people classify facial expressions. For example, Ekman, (1994), points out that disgust often appears as a "common confusion" or second most frequent response for anger in facial expression studies; and the two facial expressions, as we observe in this article's Footnote 1, sometimes share a common action unit. Although our study was interested in the differences between the two emotions, and thus focused only on ratings of the two kinds of faces, it should be recognized that in the larger scheme of emotions, disgust and anger as emotions of disapproval are close neighbors.

In other similar studies independently manipulating socio-moral and bodily-moral violations in different scenarios, it has also been shown that when controlling for their correlation with each other, disgust independently responds most reliably to perceptions of bodily norm violation, while anger responds to perceptions of harm and rights violation (Gutierrez & Giner-Sorolla, 2007; P. S. Russell & Giner-Sorolla, in press). These results are corroborated by our finding here, especially among facial endorsement measures, that anger was greater when socio-moral harm was described, and disgust was greater when bodily-moral violations were described.

In response to the literature suggesting that moral disgust governs responses to non-bodily norm violations, a number of observations can be made. First, many studies manipulating or measuring disgust and observing effects on judgment of non-bodily moral norms have not taken the possibility of co-activated anger into account, often using the low-arousal negative emotion of sadness as a control (e.g. Wheatley & Haidt, 2005; Schnall et al., 2008) or no comparison emotion at all (e.g. Chapman, Kim, Susskind & Anderson, 2009 and the response by Rozin, Haidt & Fincher, 2009; Danovitch & Bloom, 2009). Studies that have taken care to contrast bodily and non-bodily moral elicitors of disgust find non-bodily elicitors to show quite different profiles. In particular, socio-moral elicitors, relative to bodily elicitors, lead to a form of disgust that shows a much higher correlation with verbal reports of anger (e.g., Simpson et al., 2006). This is entirely consistent with our findings. However, apart from the converging results using facial endorsement measures, our results also build on Simpson et al.'s in that we have taken greater steps to ensure comparability of the settings of our non-bodily and bodily elicitors, and also have used bodily elicitors that are relevant to morality in the areas of food and sexuality.

Our research can also perhaps clarify previous inconsistent results about the differences and similarities between anger and disgust. While some research suggests that anger and disgust are closely related, based on characteristics such as activation and unpleasantness (e.g., J. A. Russell & Feldman Barrett, 1999), other research highlights the differences between these two emotions as having distinct evolutionary and adaptive functions (e.g., Izard, 1992). Although previous research has established some degree of overlap in the use of words that refer to these two emotions, the role of context in moral violations and its effect on the use of these words was not experimentally tested. Our research offers a contextual clarification to contrasting findings in this debate, showing that disgust shows varying degrees of independence from anger depending on the kind of moral violation contemplated. While it is also inescapably true that the two emotions co-occur to a great extent and are often activated together even in bodily-moral situations, distinctions between them are potentially important for predicting, for example, whether action tendencies will be hostile or avoidant (Gutierrez & Giner-Sorolla, 2007).

Because we used endorsement of facial expressions as a non-verbal indicator of emotions, it is important to clarify the assumptions behind our approach. A prevalent view holds that facial expressions are a reliable way to differentiate emotions, being an integral part of the emotional experience (Damasio, 1999), and that facial expressions signal specific emotions, at least where the "basic" emotions anger and disgust are concerned (Ekman, 1999). However, this view has been challenged by evidence that facial expressions interact with the situation in which the emotion is produced, so that verbal classifications of a given facial expression can be altered by context (Carroll & J. A. Russell, 1996; Feldman Barrett, Lindquist & Gendron, 2007). Against this backdrop we need to make clear that we do not necessarily take facial expressions as an infallible indicator of a "true" emotional state, merely as a non-linguistic indicator differentiating two emotions whose referent terms in English seem to cluster quite closely. Certainly future research should triangulate these findings against more than two types of measurement – for example, specific physiological responses, brain region activation, or action tendencies, to the extent that these can reliably differentiate anger from disgust. Meanwhile, our results do bear out the importance of context in labelling of facial expressions, suggesting that the accepted facial expressions and words for disgust may relate most reliably to each other when the context involves elements of bodily disgust, rather than other moral violations.

To conclude, it has been suggested that the moral domain is based on universal categories and that emotional reactions have a close resemblance to this moral categorisation. For example, the CAD triad hypothesis proposes three moral domains (Rozin et.al, 1999; Shweder, Munch, Mahaptra & Park,

1997), while Haidt and Graham (2007) proposed five moral domains. In both cases disgust is an emotion associated with the violation of norms related to purity, sanctity and the body. However, based on our results, researchers may find that violations of the domain of autonomy (in the CAD hypothesis) and the domain of harm (in Haidt's five foundations proposal) that theoretically elicit anger can at the same time bring forth words related to disgust. As a final suggestion, therefore, we propose that researchers use alternate measures of these two emotions, such as facial endorsement measures, as a way to gain a clearer picture of emotional reactions to moral violations. Only then can a clearer answer emerge to the question of what is truly morally disgusting, and what this means for judgment and behavior.

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Appendix 1

Scenarios used in our experiment. The socio-moral version is listed, with differences from the bodily-moral version in brackets.

Sexual relationship (main character: “the woman”)

A 20-year-old man and a [23-year-old woman] [*bodily-moral version:* 76-year-old woman] who work in the same place begin to have a sexual relationship. [The woman is the man’s supervisor in the organisation, so he feels pressured to continue the relationship.] [*bodily-moral version:* They are at the same rank in the organisation, so neither one feels pressured to continue the relationship.]

Meat substitute (main character: “the man”)

A man invites his friends over to dinner. He asks them if they would be all right with eating [roast duck] [*bodily-moral version:* roast vulture] that he shot on a recent hunting trip. The friends say that they would rather not eat duck. [He serves them the duck dish anyway, saying that it’s chicken, and they eat it.] [*bodily-moral version:* The friends all agree. He serves them the vulture dish and they eat it.]

Body modification (main character: “the man”)

A boyfriend and girlfriend are travelling abroad. The man thinks the woman would look good with [a small, colorful tattoo] [*bodily-moral version:* a permanent, raised, circular scar] on her thigh as a body decoration. [She doesn’t agree, so he gets her drunk, and when she is barely conscious, he takes her into a tattoo parlor to have it done.] [*bodily-moral version:* She agrees and goes into a scarification parlour to have it done.]

Cloned steak (main character: “the scientist”)

[A scientist studying recent advances in human memory is investigating a new drug that may increase the capabilities of human memory.] [*bodily-moral version:* A scientist studying recent advances in cell cloning technology takes a group of muscle cells from her arm and clones them in a vat]. [She takes some chemicals and produces a white powder without odour or taste. When the process is finished, she gives it to her friends at a dinner without their knowledge.] [*bodily-moral version:* The cells grow into a strip of human muscle tissue about the size of a steak. When the process is finished, she takes the strip of tissue, grills it, and eats it alone for dinner.]