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Abstract

Disgust motivates disease avoidance but it is unclear why it is also reported towards moral violations. Previous explanations have focused on identifying the type of violation specific to disgust. Here, we propose that people will express disgust towards any type of moral violation in order to communicate particular motives. Unlike anger, which can be seen as self-interested, disgust communicates a more disinterested, moral motivation. In two experiments we show that observers infer more moral motivation from an expression of disgust, and more self-interested motivation from anger. Two further experiments testing participants' own expression decisions demonstrated that disgust is chosen more to show moral concern and anger is chosen to protest harm to one's self-interest. By shifting focus to the interpersonal effects of emotion expressions, these findings offer a new perspective for understanding the role of disgust in morality.

Keywords: disgust, anger, morality, social signalling

Communicating Moral Motives: The Social Signalling Function of Disgust

Research into disgust has investigated the elicitors that distinguish it from its fellow other-condemning emotions such as anger. In line with disgust's role in pathogen avoidance (Curtis, Aunger & Rabie, 2004; Oaten, Stevenson & Case, 2009), it has been argued that disgust arises when a moral violation includes contamination or transgressions of bodily norms, referred to as "purity" violations (Horberg, Oveis, Keltner & Cohen, 2009; Rozin, Lowery, Imada & Haidt, 1999; Russell & Giner-Sorolla, 2013; Pizarro, Inbar & Helion, 2011). However, others maintain that disgust has a wider role in condemnation of acts not involving impurity, such as cheating or stealing (Cannon, Schnall & White, 2010; Chapman, Kim, Susskind, & Anderson, 2009; Danovich & Bloom, 2009; Tybur, Lieberman & Griskevicius, 2009). For example, Cannon et al. showed facial electromyographic activation specific to disgust but not anger when participants read about unfairness. These kinds of findings have been explained by extension from pathogen-defence; that is, social rule violators are seen as "contaminants" (Graham, Haidt & Nosek, 2009; Chapman & Anderson, 2013; Inbar & Pizarro, 2014; Zhong & House, 2014).

Here, we propose that emotions do not only regulate individual behaviour, but also have a communication function in signalling social motivations to others. This derives from the behavioural ecology view of emotion expressions as signals of intent toward other individuals (Hinde, 1985; Fridlund, 1994), as well as perspectives on the communicative and inter-personal functions of emotions (Fischer & Manstead, 2008; Giner-Sorolla, 2012; Hareli & Hess, 2012; Parkinson, 2005; Van Kleef, 2009). Specifically, we suggest that anger and disgust can be distinguished by what they communicate: Observers infer more self-interested motivation from anger but more moral motivation from disgust. Thus, people should express anger or disgust

depending on whether they seek to communicate moral or self-interested motivation. From this perspective, disgust is not just an expression of an inner reaction to impurity, but a signal which advertises a moral position.

A complementary perspective on moral disgust was presented by Tybur, Lieberman, Kurzban & DeScioli, (2013). They suggested that disgust functions as a signal to recruit observers of the expression to help condemn and punish the violator of a rule that the expresser favours. Here we do not test whether disgust effectively inspires collaborative behaviour but, based on the assumption that people can be motivated to communicate their moral position whether or not they expect to influence observers' behaviour, we test a compatible hypothesis: That the decision to express disgust versus anger depends on the motives the expresser seeks to communicate.

Anger Protects Direct Self-interest

Anger arises when a person perceives their interests to be harmed (Frijda, 1994; Keltner & Haidt, 1999; Kuppens et al., 2003). An expression of anger communicates the intention to approach and aggress, and that the recipient of anger should make concessions (Van Kleef, De Dreu & Manstead, 2004), discouraging future transgressions towards the expresser (Sell, Tooby & Cosmides, 2009).

However, a person who expressed anger too readily could suffer social and reputational damage. Anger can lead another person to exclude or distrust the expresser (Van Beest, Van Kleef & Dijk, 2008; Dunn & Schweitzer, 2005). Due to these potential costs, anger should only be deployed when violations that have clear, countervailing costs to the individual. Purely moral concerns that transcend an individual's self-interest would fail this cost-benefit logic of anger.

Accordingly, although anger can be aroused by moral concerns like injustice, it is more consistently aroused by selfish concerns such as goal blockage (Hutcherson & Gross, 2011; Kuppens, 2003). Thus, observers are likely to infer that anger is motivated by self-interest, especially in socially ambiguous situations; hence a different emotional expression might be more useful to signal unselfish moral concern.

Does disgust communicate disinterested condemnation?

Disgust does not prepare aggressive action in the way that anger does (Roseman, Wiest & Swartz, 1994), so it may be appraised as less self-serving. Furthermore, because things are usually disgusting by general consensus, at least within a cultural group (e.g. foods, sexual acts), an observer of a disgust expression would appraise, not so much that a selfish goal has been blocked, but that a consensually offensive stimulus has been encountered. These features underlie our prediction that, in contrast to anger, people will infer disgust expressions to be motivated more by moral concern than by self-interest. And if expressers also have implicit knowledge that observers make motive inferences from expressions, they should strategically express anger and disgust to communicate these motives.

Present Research.

Experiments 1 and 2 presented a scenario in which a target expresses either anger or disgust towards a wrongdoing and participants' inferences about the target's moral versus self-interested motivation were measured.

In Experiment 3, we gave participants a scenario in which their aim was either to communicate self-interest or moral concern and measured which emotion they

chose to express. For a stringent test, Experiment 4 used a concrete scenario involving harm to the self, to see whether the aim of communicating moral motivation would increase disgust expression under conditions that would normally predict anger (Hutcherson & Gross, 2011). We report all measures, all manipulations, data exclusions, and *a priori* sample size rationale. Experiments 2, 3 and 4 were preregistered¹, including all hypotheses described.

Experiment 1

Method

Participants. Based on an effect size ($d = .91$) in similar research on emotion communication (Hareli & Hess, 2010), a power analysis using GPower 3.1.9.2., recommended a sample size of 66 at 95% power. This was increased by 25% to allow for incomplete responses and exclusions based on an attention check question. Amazon MTurk was used to recruit 84 (34 female) participants from the United States ($M_{\text{age}} = 36.18$, $SD = 11.11$). Due to an error, allocation to anger and disgust conditions was not evenly balanced, resulting in 34 participants in the anger condition and 50 in the disgust condition.

Materials and procedure.

Scenario. The participant imagines seeing a colleague expressing either disgust or anger in response to a violation. Minimal information about the violation was given, to ensure that participants made inferences based on the emotion expressed and not on other clues about the situation. Ambiguous social situations have also been used in previous research to investigate inferences based on expressed emotion, rather

¹ Preregistrations and data can be found on the OSF website, <https://osf.io/4ac5p/>

than the situation (VanDoorne, et al, 2015). The scenario consisted of the following text (word changes for the disgust condition in brackets):

“You are at work in a job that you have only just started and you are sitting in the breakroom during your break. Two of your colleagues come into the room and sit at the table at the other end of the room. After a few minutes you overhear one of your colleagues talking and, although you do not know her well, you recognize the voice as belonging to your colleague Mary.

You can't hear all of the conversation from where you are but from what you hear, you can tell that they are talking about someone else who has done something wrong. You can tell from Mary's voice that she sounds angry (disgusted). A minute later, you over-hear the words "I am angry (disgusted)". You decide to glance up at her and when you see her face, you can tell from her expression of anger (disgust) that her feelings are strong.”

Participants were then asked to complete several dependent measures.

~~**Perceived victim.** Participants were asked to infer who was likely to be the victim of the wrongdoing from the following options: ‘Mary’, ‘Mary’s friend’, or ‘someone else Mary doesn’t know very well’.~~

Comment [T1]: Moved to supplemental appendix

Perceived Motives. Participants were asked “Based on what you saw and heard, why do you think Mary feels this way about whatever has happened? How likely are the following to be true?” Nine items were rated on a scale from 0, ‘not at all likely’, to 6, ‘very likely’, assessing how selfish, other-caring and moral the

target's motives were perceived to be. The selfish items were: 'she is mainly concerned about herself', 'she is concerned about how something has affected herself' and 'she feels that she has been wronged' ($\alpha = .83$). The other-caring items were: 'she is concerned about something bad happening to someone else', 'she is worried someone else's feelings might be hurt' and 'she feels this way on behalf of someone else' ($\alpha = .85$). The moral concern items were: 'she mainly feels this way out of principle', 'she feels that something immoral has happened' and 'she feels this way because it is always wrong to cheat'. However, these items had inadequate reliability ($\alpha = .25$). Since the second item was the only one that was unambiguously about the target's moral concern, the other two items were dropped.

Results

Four participants were excluded from analysis because they incorrectly identified the emotion expressed by the target. Where data violated sphericity, adjusted values are reported.

Perceived victim. Figure 1 shows the perceived victim when the target expressed anger versus disgust. There was a significant association between the target's emotion expression and the perceived victim, $\chi^2(2, N = 80) = 14.39, p < .001$, Cramér's $V = .42$. The target herself was perceived to be the victim more frequently when expressing anger than disgust, $\chi^2(1, N = 50) = 5.33, p = .02$, Cohen's $w = .33$. The target's friend was perceived to be the target more frequently when the target expressed disgust compared to anger, $\chi^2(1, N = 19) = 6.88, p > .001$, Cohen's $w = .60$. A stranger was also perceived to be the target more frequently when the target expressed disgust compared to anger but this difference was not significant, $\chi^2(1, N = 11) = 2.18, p = .14$, Cohen's $w = .45$.

Figure 1. Frequency of inferences made by participants about whether the victim of the violation was the target herself, the target's friend, or a stranger, when the target expressed anger versus disgust.

Perceived Motives. A repeated measures analysis of variance (ANOVA) with emotion as a between subjects factor and perceived motive as a within subjects factor revealed a main effect of motive, $F(1.33, 103.80) = 17.21, p < .001, \eta_p^2 = .18$, but no main effect of emotion, $F(1, 78) = .30, p = .59, \eta_p^2 = .004$. A significant interaction was revealed, $F(1.33, 103.80) = 12.90, p < .001, \eta_p^2 = .14$. As can be seen in Figure 1, an expression of anger led participants to infer more self-interested motivation than disgust, $F(1, 78) = 13.77, p < .001, \eta_p^2 = .15$. The target's motives were rated as more other-caring when disgust was expressed, $F(1, 78) = 8.65, p = .004, \eta_p^2 = .10$, and as marginally more moral with disgust, $F(1, 78) = 3.56, p < .063, \eta_p^2 = .044$.

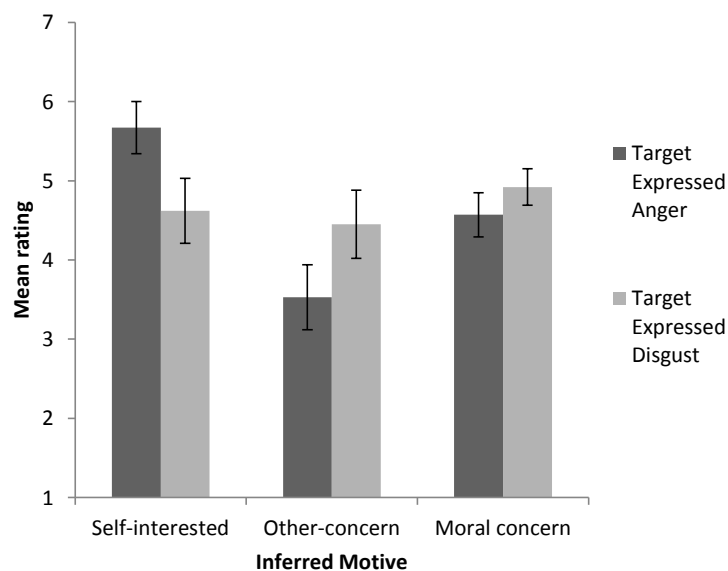


Figure 1. Motives inferred by participants when the target expressed anger versus disgust. Error bars represent 95% confidence intervals.

In summary, participants inferred that an expression of disgust was motivated more by moral and other-concern and that anger was motivated more by self-interest².

~~This is consistent with the finding that participants were more likely infer that the victim of a wrongdoing was the target themselves when the target expressed anger than when the target expressed disgust.~~

Comment [T2]: Perceived victim information moved to supplemental

Experiment 2

Experiment 2 aimed to replicate findings from Experiment 1, including additional items for the measurement of moral concern, due to the low reliability of the scale in Experiment 1, and also varying the gender of the target. We also investigated whether inferences about the target's motives were extended to judgements about their character, given findings that expressed emotions are sometimes seen as diagnostic of personality characteristics (e.g. Hareli & Hess, 2010).

~~Since we did not find that inferred motives extended to character inferences, this information is included in the supplemental appendix.~~

Comment [T3]: Trait information moved to supplemental

Method

Participants. Amazon MTurk was used to recruit 200 (72 female) participants from the United States ($M_{age} = 32.49$, $SD = 11.01$). Expecting similar effect sizes to Experiment 1 ($\sim d = .70$), a power analysis (with desired power at .90) gave a recommended sample size of 176. We aimed to collect 200 participants to allow for exclusions based on an attention check question.

Materials and Procedure.

² Consistent with these findings, an additional dependent variable used in Experiments 1 and 2 showed that participants were more likely infer that the victim of a wrongdoing was the target themselves when the target expressed anger and a stranger when the target expressed disgust. For details see online materials.

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Scenario. The scenario was the same as in Experiment 1, except that the gender of the target was varied. The names Robert and Mary were used because in research by Cotton, O'Neill & Griffin (2008), they were rated equally American, Caucasian and likeable. Participants then completed the following dependent measures.

Perceived Motives. Participants are asked “Based on what you saw and heard, why do you think Mary (Robert) feels this way about whatever has happened? How likely are the following to be true?” and rated items from 0, ‘not at all likely’, to 6, ‘very likely’. Items measuring self-concern ($\alpha = .74$) and other concern ($\alpha = .78$) were the same as in Experiment 1. Items assessing moral motivation were divided into 3 moral concern items and 3 **principledisinterested** items. The moral concern items were: ‘she(he) thinks someone has behaved unethically’, ‘she (he) feels this way because someone’s behaviour violated a moral principle’ and ‘she (he) feels this way because she (he) thinks important moral rules have been broken’ ($\alpha = .79$). The principled items were: ‘she (he) would feel this way about what happened no matter who was involved’, ‘she (he) thinks that people shouldn’t ever behave like that’ and ‘she (he) would feel this way about what happened whoever the victim was’. The reliability of the principled items was unacceptable ($\alpha = .56$), so the second item was dropped and the remaining two items correlated well ($r = .59$).

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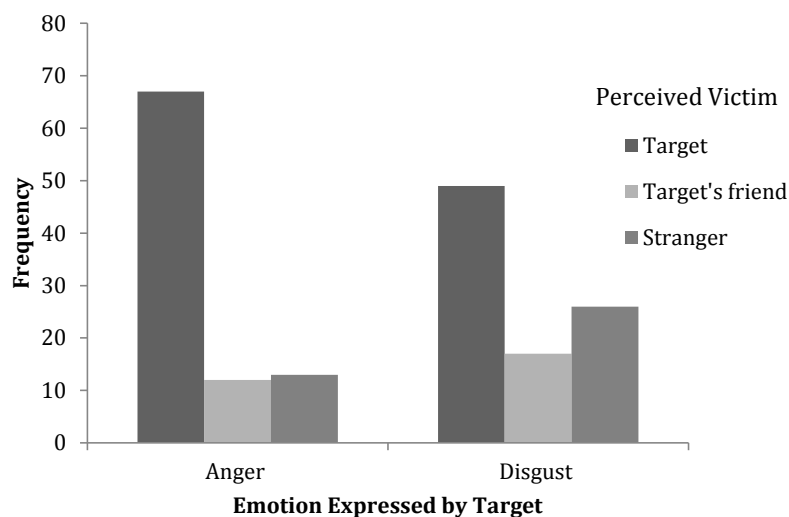
~~**Trait inferences:** Participants were asked “Based on what you saw and heard, to what extent do you think that Mary (Robert) is likely to have the following characteristics?” Items for three of the traits were from Leach, Ellemers & Barreto (2007). Perceived competence was assessed with 3 items: competent, intelligent and skilled ($\alpha = .82$). Warmth was assessed with 3 items: likeable, warm and friendly ($\alpha = .90$). Morality was assessed with 3 items: honest, sincere and trustworthy ($\alpha = .83$).~~

The dominance items: dominant, assertive and forceful ($\alpha = .83$) were from Anderson & Kilduff (2009). Participants also rated how masculine and feminine they perceive the target to be. To measure 'negative aggression', 3 items were used: hostile, aggressive and out of control ($\alpha = .81$). All items were rated from 0, not at all, to 6, a lot like this.

Results

Sixteen participants were excluded because they incorrectly identified the emotion expressed by the target.

Perceived victim. Figure 3 shows the perceived victim when the target expressed anger versus disgust. There was a significant association between the type of expression and the perceived victim of the wrongdoing, $\chi^2(2, N=184) = 7.99, p = .02$, Cramér's $V = .21$. A stranger was perceived to be the victim more frequently when disgust was expressed compared to anger, $\chi^2(1, N = 39) = 4.33, p = .04$, Cohen's $w = .33$. The target's friend was more frequently perceived to be the victim when the target expressed disgust compared to anger but this difference was not significant, $\chi^2(1, N = 29) = 0.86, p = .35$, Cohen's $w = .17$. The target's self was perceived to be the victim more frequently when expressing anger compared to disgust, but this difference did not reach significance, $\chi^2(1, N = 116) = 2.79, p = .09$.

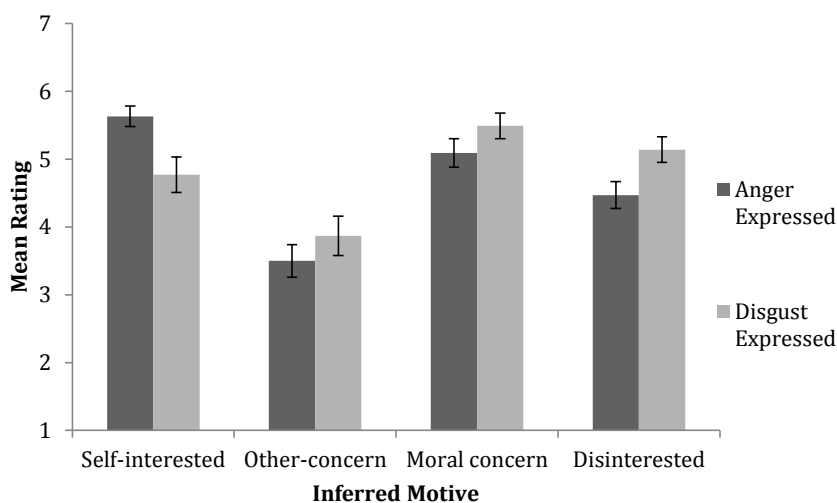


Cohen's $w = .16$. The pattern of results was similar irrespective of the gender of the target but effects were stronger for the male target, despite clear results for the female target in Experiment 1. Separate analyses for male and female target are shown in the supplemental appendix available online.

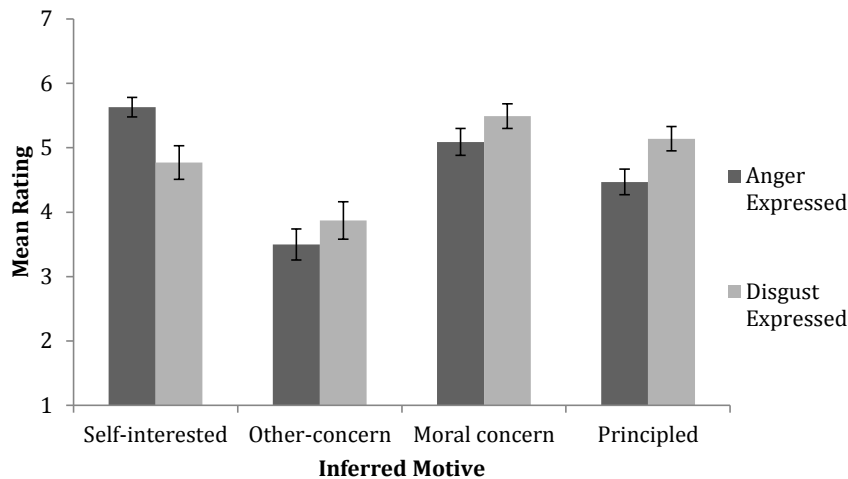
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Figure 3. Frequency of inferences made by participants about whether the victim of the violation was the target, the target's friend, or a stranger, when the target expressed anger versus disgust.

Perceived motives. An ANOVA with emotion expressed and gender of target as between subjects factors and perceived motives as a within subjects factor revealed a main effect of motive, $F(2.55, 458.67) = 120.64, p < .001, \eta_p^2 = .40$, but no main effect of emotion expressed, $F(1, 180) = 1.83, p = .18, \eta_p^2 = .01$, or gender of target, $F(1, 180) = 0.12, p = .73, \eta_p^2 = .00$. There was a significant 3 way interaction, $F(2.55, 458.67) = 3.89, p = .009, \eta_p^2 = .021$. Figure 2 shows mean ratings for each motive. Participants inferred more selfish motivation from anger, $F(1, 180) = 32.26, p < .001, \eta_p^2 = .15$. They inferred more other-caring motivation from disgust, $F(1, 180) = 3.97, p = .48, \eta_p^2 = .02$, as well as more moral, $F(1, 180) = 7.49, p < .007, \eta_p^2 = .04$, and more principled, $F(1, 180) = 22.89, p < .001, \eta_p^2 = .11$, motivation from disgust than from anger. The direction of results was similar for male and female target but effects



were stronger for the male target. Separate analyses for target genders are shown in the supplemental appendix available online.



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Figure 2. Motives inferred by participants when the target of the scenario was expressing anger versus disgust. Error bars represent 95% confidence intervals.

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compared to disgust, $F(1, 180) = 32.26, p < .001, \eta_p^2 = .15$. They inferred more other-caring motivation when disgust was expressed compared to anger, $F(1, 180) = 3.97, p = .048, \eta_p^2 = .02$, as well as more moral, $F(1, 180) = 7.49, p < .007, \eta_p^2 = .04$, and more disinterested, $F(1, 180) = 22.89, p < .001, \eta_p^2 = .11$, motivation when disgust was expressed. The direction of results was similar for male and female target but effects were stronger for the male target. Separate analyses for male and female target are shown in the supplemental appendix available online.

Figure 4. Motives inferred by participants when the target of the scenario was expressing anger versus disgust. Error bars represent 95% confidence intervals.

Trait inferences. An ANOVA with emotion and gender of target as between subjects factors and trait inferences as a within subjects factor revealed a main effect of trait, $F(1.76, 317.03) = 14.28, p < .001, \eta_p^2 = .073$, but main effects of emotion expressed, $F(1, 180) = .79, p = .38, \eta_p^2 = .004$, and gender of expresser $F(1, 180) = .82, p = .37, \eta_p^2 = .005$, were not significant, nor were there any significant interactions. Only trait negative aggression significantly differed between emotion conditions, and only for the male target: it was higher when anger was expressed ($M = 4.35, 95\% \text{ CIs } [3.99, 4.71]$) compared to disgust ($M = 3.81, 95\% \text{ CIs } [3.45, 4.18]$), $F(1, 180) = 4.26, p = .04$. Mean ratings for all inferred traits and correlations between inferred traits and inferred motives are shown in the supplemental appendix available online.

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Overall, Experiment 2 provided further evidence that disgust expressions communicate more moral and other-concerned motives compared to anger.

Experiment 3

Experiment 3 investigated whether people strategically deploy anger and disgust depending on the motives they aim to communicate. We predicted that participants would choose to express more disgust than anger to show moral concern, but more anger than disgust to show self-concern. We also varied whether the emotion was expressed towards a second party (the moral violator), or towards a third party audience. This explored the possibility that, in communicating with a second party, the value of anger in moral communication might increase, because of the possibility of changing behaviour directly.

Method

Participants. Amazon MTurk was used to recruit 204 participants (82 female) from the United States ($M_{\text{age}} = 35.75$, $SD = 12.36$). Although Experiment 3 investigated participants' own expression choices rather than inferences about others' expressions, similar effect sizes were expected ($\sim d = .70$). A power analysis with desired power at .90 recommended a sample size of 176 (as in Experiment 2). We aimed to collect 220 participants to allow for incomplete responses and exclusions based on an attention check question.

Materials & Procedure.

Scenario. Minimal information about the violation was given to ensure that participants chose an expression based on their communicative aim and not on other situational information. The scenario consisted of the following text (word changes for the harm-to-self condition in brackets):

“You are at work and you are sitting in the break room during your lunch break talking to your colleague, Mary. You are talking about another colleague you know called Robert, who has done something bad which you feel strongly about because it was immoral (harmed you).

You are trying to get Mary to understand that you feel strongly about what Robert did because he broke an important moral principle (it harmed you personally).”

In the second party condition, participants imagined talking directly with the person who committed the violation (word changes for the harm-to-self condition are given in brackets):

You are at work in the break room during your lunch break and you are talking to your colleague, Robert. Robert has done something bad which you feel strongly about because it was immoral (harmed you personally).

You want to make sure that Robert understands that you feel strongly about what he did because he broke an important moral principle (it harmed you personally).

Participants then completed several dependent measures:

Emotion label. Participants were asked: ‘Which emotion would you be most likely to express?’ and chose from ‘angry’, ‘disgusted’, ‘afraid’ and ‘joyful’.

Emotion facial expression. Participants were asked ‘Which of the facial expressions shown below would you be most likely to show?’ and chose from anger, fear, disgust and joy facial expressions. Images were obtained from the Radboud faces database (Langner et al., 2010). The expressions were portrait views from the first model in the database, a Caucasian adult female.

Emotion label scale. Participants were asked ‘How much of each emotion do you think you would express in this situation?’ and rated the four emotion labels from 0, ‘none’ to 6, ‘a lot’.

Results

Sixteen participants were excluded due to incomplete responses and 7 because they failed the attention check question. Analyses are conducted only for the emotions of interest, anger and disgust.

Emotion label. There was a significant association between communicative aim and emotion expression chosen, $\chi^2(1, N = 190) = 43.44, p < .001$, Cramér's $V = .48$. As shown in Figure 3, when participants' aim was to show moral concern, they chose to express disgust more frequently than anger, $\chi^2(1, n = 96) = 21.58, p < .001$, Cohen's $w = .47$, but when participants' aim was to show concern about harm to themselves, anger was chosen more frequently than disgust, $\chi^2(1, n = 94) = 22.03, p < .001$, Cohen's $w = .48$. This pattern of results held across audience conditions: there was no significant difference between how often anger and disgust labels were chosen when communicating with a third party compared to a second party, $\chi^2(1, n = 190) = 2.87, p = .09$, Cramér's $V = .12$.

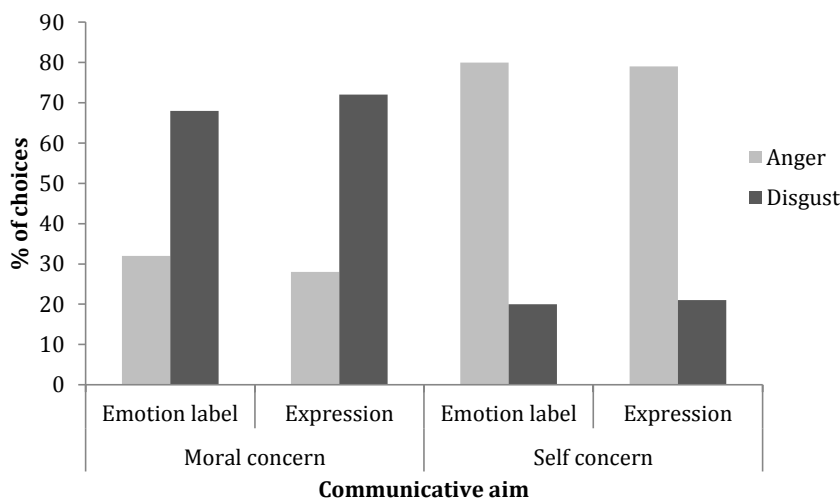


Figure 3. Percentage of choices made by participants between expressing anger or disgust, indicated by choice of emotion label and facial expression, when their aim was to communicate moral versus self-concern. Results are collapsed across third and second party conditions.

Emotion facial expression. As shown in Figure 3, there was a significant association between communicative aim and choice of facial expression, $\chi^2(1, N = 186) = 47.99, p < .001$, Cramér's $V = .51$. When participants' aim was to show moral concern, they chose disgust more frequently than anger, $\chi^2(1, n = 95) = 23.55, p < .001$, Cohen's $w = .50$, but when their aim was to show concern about harm to themselves, they chose anger more than disgust, $\chi^2(1, n = 91) = 24.58, p < .001$, Cohen's $w = .52$. There was no significant difference between how often anger and disgust facial expressions were chosen in the second and third party conditions, $\chi^2(1, N = 186) = 1.50, p = .22$, Cramér's $V = .09$.

Emotion scale. An ANOVA with communication aim and audience as between-subjects factors and amount of emotion as a within-subjects variable revealed no main effects of emotion, $F(1, 186) = 1.07, p = .30, \eta_p^2 = .00$, audience, $F(1, 186) = 0.97, p = .33, \eta_p^2 = .00$, or communicative aim, $F(1, 186) = 0.52, p = .47, \eta_p^2 = .00$. The two-way interaction between emotion and audience was not significant, $F(1, 186) = 0.66, p = .42, \eta_p^2 = .00$, nor was there a significant three-way interaction, $F(1, 186) = 0.39, p = .53, \eta_p^2 = .00$. However, there was a significant interaction between the emotion chosen and the participants' communicative aim, $F(1, 186) = 45.78, p < .001, \eta_p^2 = .20$. As can be seen in Figure 4, when the participants' aim was to communicate moral concern, significantly more disgust than anger was chosen, $F(1, 186) = 16.64, p < .001, \eta_p^2 = .08$, but when the participants' aim was to communicate self-concern, more anger than disgust was chosen, $F(1, 186) = 30.06, p < .001, \eta_p^2 = .14$.

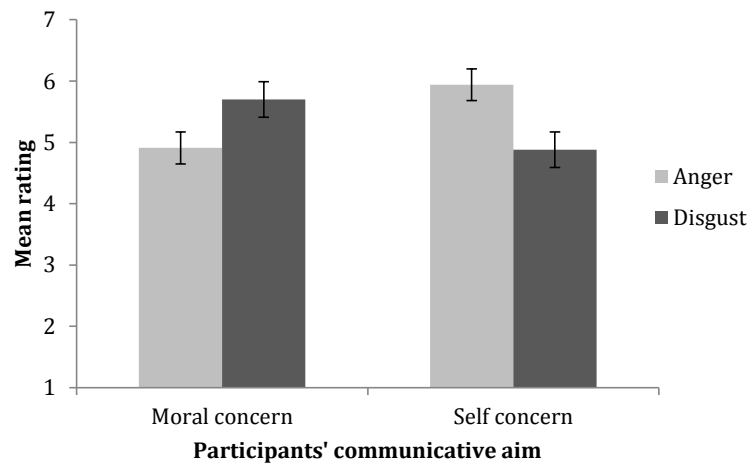


Figure 4. Amount of disgust and anger chosen by participants when their aim was to communicate moral concern versus self-concern, collapsed across third and second party conditions. Error bars represent 95% confidence intervals.

In summary, participants predominantly chose to express disgust, rather than anger, in order to communicate moral concern but they chose to express anger, rather than disgust to communicate that their own interests had been harmed.

Experiment 4

Hutcherson & Gross (Study 2, 2011) found that feelings of disgust are higher when the victim of a transgression is a stranger, while feelings of anger are higher when the victim is the self, and intermediate for a friend. Our scenario in Experiment 3 did not specify whether the victim was the self or a stranger but only varied participants' communicative aim. As a more stringent test of whether the goal of communicating moral motives increases the likelihood of expressing disgust, Experiment 4 explicitly identified the self as the victim of a harm transgression, favouring feelings of anger. However, we predicted that despite *feeling* anger, the number of participants choosing to *express* disgust would increase if their

Comment [R7]: Perhaps in the cover letter you should explain there were actually 2 pre-registered studies, you found suggestive but not full support from the 1st one (describe what worked and what didn't) and the methodological reasons you changed and improved it to this one. If he wants we can include the additional study in the appendix. I think this is the best way to get around file drawer concerns while respecting the word limit. Also, with the kind of power we have it is to be expected that 1/5 studies does not work in a significance sense!

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communicative aim was to show morally motivated condemnation. When their communicative aim was to protest harm-to-self, they would express anger.

This design also enabled us to show whether our findings hold with a ~~more concrete scenario and whether our predictions apply to~~ that was explicitly described a harm violation, ~~contrary to accounts that argue for a specific link between disgust and impurity content in violations (e.g. Graham, Haidt & Nosek, 2009).~~ If so, this would provide one reason why disgust is sometimes expressed even to harm violations, which more usually evoke anger (see Chapman & Anderson, 2013, contra Russell & Giner-Sorolla, 2013): respondents may feel the need to communicate moral motivation.

Method

Participants: Although Experiment 4 was similar in design to Experiment 3, we conservatively expected small to medium effect sizes (\sim Cramér's $V = .20$) due to differences in design. A power analysis with desired power at .90 recommended a sample size of 263. We aimed to collect 20% extra participants to allow for incomplete responses and exclusions based on an attention check question. From Amazon MTurk, 296 participants (156 female; $M_{\text{age}} = 37.48$, $SD = 11.51$) completed the study.

Materials and Procedure

Scenario

The first part of the scenario was the same for the 2 communicative aim conditions and the felt emotion comparison condition:

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“At your place of work you and your colleague, Robert, have recently completed a project that you have both been working on for the past few weeks. You were equal partners on the project. If anything, you feel that you worked a bit harder than Robert but you are pleased that the project was a success and you are happy to give him equal credit.

However, you have just been told by another colleague that Robert presented the results of the project to the managers of the company. He made it sound as if he had done the majority of the work himself. Since he was given almost all of the credit for the work, he was awarded a significant amount of money as a bonus.

If your colleague had not told you about this, you might not even have found out. When you saw Robert recently, he did not mention anything about it.”

In the comparison condition, to show that anger was the predominant *felt* emotion, the scenario ended here and participants answered questions about how they would feel. In the other conditions, the following text manipulated communicative aim (word changes for the harm-to-self condition are given in brackets):

“A short while after you find out about what had happened, you are in the break room during your lunch break with your colleague Mary.

You still feel strongly about what happened and you are trying to make it clear to Mary that you feel this way about what Robert did because he broke an important moral principle (harmed you personally).

Which emotion would you be most likely to express to show that you feel strongly about what Robert did because it was immoral (harmed you personally)?”

Next, participants completed the following dependent measures:

Emotion label. Participants were asked: ‘Which emotion would you be most likely to express to show that you feel strongly about what Robert did because it was immoral (harmed you personally)?’ Or in the felt emotion condition, ‘Which emotion would best describe how you would feel when you found out about what Robert did?’ They chose from ‘angry’, ‘disgusted’, ‘afraid’ and ‘joyful’.

Emotion label scale. Participants were asked ‘How likely would you be to express each emotion in this situation?’, or ‘How likely would you be to feel each emotion in this situation?’, and rated the four emotion labels from 0, ‘not at all’ to 6, ‘definitely’.

Emotion facial expression. In the expressed emotion conditions, participants were asked ‘Which of the facial expressions shown below would you be most likely to show?’ and choose from anger, fear, disgust and joy expressions.

Results

Ten participants were excluded for failing the attention check question. Only the emotions of interest, anger and disgust, were analysed.

Felt emotion. As expected, participants chose the label angry more frequently than the label disgusted to describe how they would feel, $\chi^2(1, N = 94) = 24.51, p < .001$, Cohen’s $w = .51$. Using the scaled responses, participants also reported that they would feel anger more than disgust, $t(94) = 4.59, p < .001, d = 0.95$. Figures 5 and 6 display these results in comparison to the communicative goal conditions.

Expressed emotion label. There was a significant association between communicative aim and emotion expression chosen, $\chi^2(1, N = 191) = 8.37, p = .004$, Cramér’s $V = .2$. When participants were given the aim to communicate concern

about harm-to self, they chose angry more frequently than disgusted, $\chi^2(1, n = 93) = 20.82, p < .001$, Cohen's $w = .4$. When they aimed to communicate moral concern, there was no significant difference in how often they chose disgusted and angry, $\chi^2(1, n = 98) = 0.5, p = .48$, Cohen's $w = .071$.

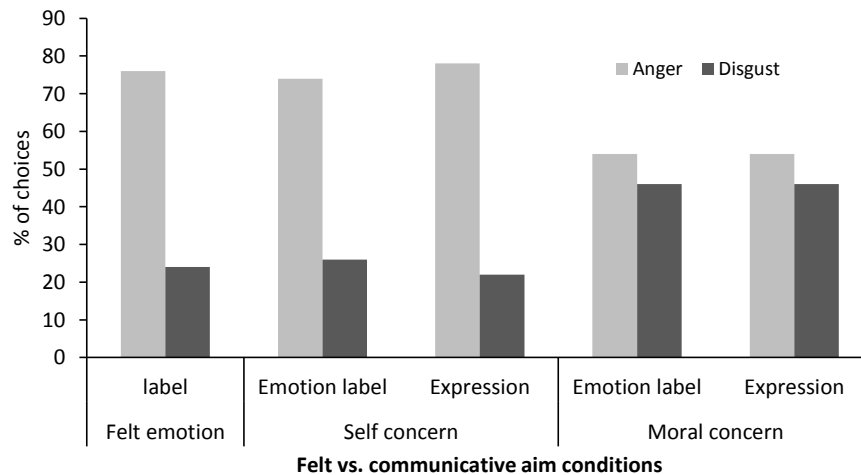


Figure 5. Percentage of choices made by participants between anger or disgust, when their aim was to communicate moral versus self-concern, compared to describing the emotion they would feel. Categorical anger/disgust choices by communication goal or felt emotion condition, Experiment 4.

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Expressed emotion facial expression. Similarly, there was a significant association between communicative aim and facial expression chosen, $\chi^2(1, N = 188) = 12.15, p < .001$, Cramér's $V = .25$. When participants were given the aim to communicate concern about harm-to self, they chose anger facial expression significantly more frequently than disgust, $\chi^2(1, n = 92) = 28.28, p < .001$, Cohen's $w = .55$. When they aimed to communicate moral concern, there was no significant difference between anger and disgust, $\chi^2(1, n = 96) = 0.52, p = .47$, Cohen's $w = .074$.

Expressed emotion scale.

An ANOVA with communication aim as a between-subjects factor and amount of emotion expressed as a within-subjects variable revealed a main effect of emotion expressed, $F(1, 189) = 18.24, p < .001, \eta_p^2 = .09$, but the main effect of communicative aim was not significant, $F(1, 189) = 0.00, p = .97, \eta_p^2 = .00$. The two-way interaction between emotion expressed and communicative aim was significant, $F(1, 189) = 18.24, p < .001, \eta_p^2 = .09$. As can be seen from Figure 6, when the participants' aim was to communicate self-concern, more anger than disgust was chosen, $F(1, 197) = 35.55, p < .001, \eta_p^2 = .16$, but when the participants' aim was to communicate moral concern, the amount of disgust was equal to the amount of anger expressed, $F(1, 197) = .000, p = 1.00, \eta_p^2 = .00$.

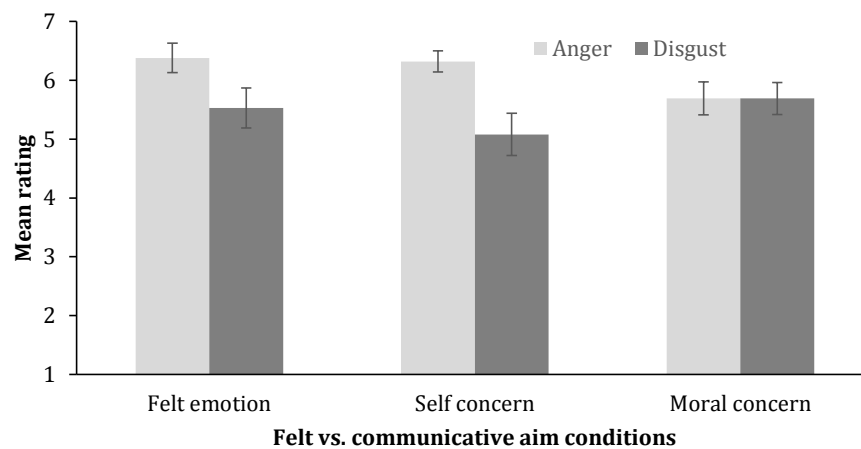


Figure 6. Amount of disgust and anger chosen by participants when their aim was to communicate moral concern or self-concern, compared to describing the emotion they would feel, [Experiment 4](#). Error bars represent 95% confidence intervals.

Comment [R9]: You mean emotion measure, anger vs. disgust

Comment [T10]: In the pre-registration I may have said it would be 2x3 anova with felt as well but maybe this is unnecessary and would not change anything apart from make results section longer

Comment [R11]: Should footnote the 2x3 result though.

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In confirmation of our previous findings, when participants aimed to communicate that their condemnation was morally motivated, the relative likelihood of expressing disgust increased to the extent that they were just as likely to express disgust as anger, despite the scenario primarily inducing *feelings* of anger. ~~This finding demonstrates that~~ Intentions to express disgust does not just depend on what one feels, but also on what one aims to communicate, even if the violation has no impure content.³

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General Discussion

These results show that an expression of disgust conveys more moral concern than a statement of anger (Experiments 1 and 2). Furthermore, our results indicate that people deliberately choose to express disgust to communicate that they are motivated by moral concern, and anger to communicate that they are motivated by self-concern (Experiments 3 and 4). These results support our social signalling hypothesis of moral disgust.

These findings suggest that if a person has a direct interest in changing another individual's behaviour, they are likely to express anger, since this communicates an intention to act to address a wrongdoing that has affected the self (Hutcherson & Gross, 2011). But if the wrongdoing does not directly affect a person's interests, yet they still appraise it as wrong or objectionable, then they are more likely to express disgust since it more effectively communicates impartial, moral condemnation.

This perspective may explain why people often report feeling disgust towards wrongdoings such as cheating or stealing, which have no cues of contamination:

³ Another preregistered study with a similar design was conducted and results were consistent with Experiment 4, though less clear-cut for the scale ratings. Due to space constraints, see supplemental materials for details.

Disgust is being used to communicate morally motivated condemnation. Even with actions that do involve purity violation, a question for future research is whether people respond with disgust predominantly because of an appraisal of contamination or impurity, or because they aim to communicate morally motivated condemnation. It could also be that the disgust expression is motivated by a combination of concerns; one might have an automatic disgust reaction towards a sexually deviant act but exaggerate the expression of disgust to make clear one's moral basis for objection.. As noted by Hinde (1985), the motives behind an emotion expression may lie somewhere on a continuum from purely expression of internal feeling, to purely strategic signalling.

~~One limitation is that to have participants base their judgements only on the expression and not on situational cues, the scenarios were vague about the details of the violation. Future research may incorporate more contextual information to confirm whether disgust is used to signal moral concern towards different types of wrong doing, such as fairness, harm and loyalty violations. Previous research has demonstrated that observers make character inferences based on the emotion that a person expresses in a situation (e.g. Hareli & Hess, 2010), so the use of additional details about the violation may reveal that observers do make inferences about the moral character of a person who expresses disgust versus anger against a more complete situational backdrop, despite our null findings in Experiment 2.~~

One question raised by the current research is how deeply communications of disgust reflect people's spontaneous feelings. If people report disgust or even produce an expression of disgust, this may not mean that they are experiencing the subjective feeling of disgust or its associated nausea, contamination and withdrawal components; rather, they may express it to convey information about their motives. This is

consistent with Fridlund's (1994) view of the function of emotion expressions: They have adaptive value because they convey information about the behavioural intentions and social motives of the expresser, not information about the expresser's internal feeling state. In the case of disgust towards wrong doings, it seems clear that communicating information about one's basis for disapproval of the behaviour has greater adaptive value than communicating one's feeling of literal or figurative contamination.

Equally, it is more useful for an observer to acquire information about whether the expresser's motives are moral versus self-interested than it is to learn about their internal feelings of contamination. It is, after all, information about the social motives, disposition and behavioural intentions of the expresser that will enable the observer to adjust their own social behaviour accordingly: Through trust and cooperation given the disinterested, moral inclination of the disgust expresser, or through appeasement or retaliation given the personal stakes suggested by anger. Future research may investigate whether observers do, indeed, behave differently (more cooperatively) towards a person who has expressed disgust versus anger towards the same wrongdoing.

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