

# Disgust and the Sacred: Do People React to Violations of the Sacred With the Same Emotion They React to Something Putrid?

Dolichan Kollareth and James A. Russell  
Boston College

Disgust has been hypothesized to be uniquely linked to violations of a distinct moral domain (called divinity, purity, or sacred) aimed at preserving one's body from contamination with pathogens and preserving one's soul from violations of what is sacred. Here we examined whether the same emotion—core disgust—occurs when witnessing both types of violation, and we proposed a specific method for doing so. In two studies ( $N = 160; 240$ ), American and Indian participants indicated their emotional reaction to (stories depicting) sacred or nonsacred violations, each either with or without pathogens. Both Americans and Indians felt “grossed out” (a term for core disgust) by events with pathogens (whether violations of the sacred or not). They felt disgusted and angered, but not grossed out, by violations of the sacred. For both Americans and Indians, grossed out was never the modal emotion when a sacred violation did not involve pathogens. Results were inconsistent with a focus on any single emotion: sacred violations were associated with several different negative emotions.

**Keywords:** culture, moral domain, pathogen, grossed-out, anger

**Supplemental materials:** <http://dx.doi.org/10.1037/emo0000412.supp>

An important development in moral psychology is the proposal of distinct moral domains, each with a different function and emotion. Our article concerns the proposed domain called divinity, purity, or sacred (Haidt, 2012; Horberg, Oveis, Keltner, & Cohen, 2009), sometimes characterized as the preservation of the sanctity of one's own body and soul. The sacred moral domain is theorized to concern violations that physically contaminate a person's own body or that degrade and debase that person's spiritual side (Haidt, 2003). The violations within this domain thus include physical contamination caused by pathogen-containing things such as spoiled food or poor hygiene, but violations also include nonphysical impurities such as blasphemy, desecrating a religious symbol, or agreeing to sell one's soul (Haidt, 2003; Haidt, 2012; Horberg et al., 2009; Rozin & Haidt, 2013; Rozin, Lowery, Imada, & Haidt, 1999). Our study began with the question of whether violations of the body and violations of what is sacred belong in the same moral domain.

To test the theory that divinity/purity/sacred is a single moral domain for both body and soul requires empirically testable hypotheses. The clearest such hypothesis is that witnessing a violation in this domain elicits disgust, whereas witnessing a violation in some other moral domain elicits another emotion. Indeed, disgust is the link between physical contamination and a violation

of what is sacred. On this theory, disgust started as a mechanism for avoidance of oral contamination with pathogens and toxins, but evolved to serve the function of avoidance of nonoral threats to health such as contact with putrid objects (Haidt, McCauley, & Rozin, 1994; Rozin & Fallon, 1987; Rozin, Haidt, & McCauley, 2008); we refer to the emotion elicited in this way as *core disgust*. For the present purposes, the next step in the hypothesized evolutionary sequence is key: core disgust was then coopted to motivate avoidance of contamination from the violation of the sacred (Haidt, 2012; Rozin, Haidt, & McCauley, 1999). There was an evolutionary expansion of the function of disgust from being the guardian of the body to the guardian of the soul, dubbed as “the body-to-soul preadaptation theory” of disgust (Rozin, Haidt, et al., 1999, Rozin, Haidt, & McCauley, 2009). Disgust thus underlies the moral condemnation of the desecration of the sacred—especially religious and quasireligious—objects and observances (Haidt, 2012; Rozin & Haidt, 2013). Thus, central to the theory of divinity/purity/sacred as a single moral domain is the important hypothesis that people react to violations of the sacred with the same emotion they react to contamination with putrid objects, such as stepping in feces.

For several decades now, evidence has been advanced said to support the claim that divinity/purity/sacred is a single moral domain (see Haidt, 2012; Horberg, Oveis, & Keltner, 2011; Rozin & Haidt, 2013 for recent reviews of this evidence). We questioned whether this evidence is definitive, however, for various reasons.

We assume that disgust is indeed the emotion that serves as a pathogen-avoidance mechanism (Curtis & Biran, 2001; Fessler, Eng, & Navarrete, 2005; Oaten, Stevenson, & Case, 2009; Rozin et al., 2008; Schaller & Park, 2011; Tybur, Lieberman, Kurzban, & DeScioli, 2013). Thus, core disgust is elicited by objects that potentially lead to infectious diseases such as dead bodies, rotting food, and body waste and fluids such as feces, phlegm, vomit,

---

This article was published Online First March 1, 2018.

Dolichan Kollareth and James A. Russell, Department of Psychology, Boston College.

We thank our collaborators in St. Xavier's College, Thumba, India, for their assistance in conducting the study.

Correspondence concerning this article should be addressed to Dolichan Kollareth, Department of Psychology, Boston College, 140 Commonwealth Avenue, Chestnut Hill, MA 02467. E-mail: [dolichan.kollareth@bc.edu](mailto:dolichan.kollareth@bc.edu)

blood, and semen (Tybur, Lieberman, & Griskevicius, 2009). Tabooed behaviors related to food and sex are therefore expected to elicit genuine core disgust (Horberg et al., 2009; Rozin, Haidt, et al., 1999). The question is whether violations of the sacred free from the threat of pathogens elicit the same reaction.

Much of the research offered in support of the claim that divinity/purity/sacred is a single moral domain is ambiguous because the violations included both sacred and pathogen elements. That is, some of the actions categorized within the sacred domain of morality confounded the violations of the sacred with pathogens: thinking of scriptures while expelling excrement (Haidt, 2003), cleaning a bathroom with the national flag (Haidt, Koller, & Dias, 1993), and acts that annihilate life such as abortion (Haidt, 2012). Therefore, perhaps, the observed disgust reaction might be a function of the possible threat of pathogens and not of the violation of the sacred per se. A minimal standard in testing the theory of a single moral domain for both body and soul is to deconfound pathogens and what is sacred. So, here we use story frames with all held constant except the key variable. There were thus two variables: sacred versus nonsacred and pathogen versus no pathogen.

Another issue is the assessment of disgust. A number of studies said to support the sacred-disgust link relied on the word *disgust*. Disgust is the key item in the self-report scale of the emotional reaction to statements (Ritter & Preston, 2011) or thoughts (Ritter, Preston, Salomon, & Relihan-Johnson, 2016) that pose a threat to one's religious beliefs. *Disgusted* is the key term in the Disgust Sensitivity Scale—a measure of the degree to which an individual reports being disgusted by various stimuli—which was found positively related to religiosity (Olatunji, Tolin, Huppert, & Lohr, 2005). However, prior evidence indicated that although the word disgust is used for dirty things, it is also used more generally to indicate dislike, disapproval, or anger (Hutcherson & Gross, 2011; Marzillier & Davey, 2004; Royzman & Kurzban, 2011; Rozin, Haidt, & Fincher, 2009). An oral inhibition index measured with concrete physical events (such as motion sickness) differentiated the disgust related to dirty things from disgust related to anger (Royzman, Leeman, & Sabini, 2008). Other studies found that, in English, the term grossed out more aptly represents a core disgust reaction associated with dirty things (Herz & Hinds, 2013; Kollareth & Russell, 2017; Nabi, 2002). Therefore, when examining the disgust reaction to sacred violations, it is important to keep in mind that the word *disgust* sometimes overlaps in meaning with *anger* and sometimes with *grossed out*. A rigorous test of the hypothesis that sacred violations elicit the same emotion as elicited by pathogen-threatening dirty things needs to examine ratings of feeling grossed-out. To address this problem, in the present study, we included both the words *disgust* and *grossed out* in the emotion response scale. More generally, studies in this research topic often provide participants with a limited set of emotion options. This limitation raises a methodological issue (might participants indicate other emotions if they were made available?) and a theoretical issue (might results be biased toward the theory of a single discrete emotional response rather than a theory predicting a more general emotional reaction such that of Gray and colleagues; Cameron, Lindquist, & Gray, 2015; Gray & Keeney, 2015.)

Two questions arise for moral violations of the sacred: (1) does witnessing a violation *without* pathogens elicit feelings of disgust or being grossed-out more when the violation is sacred than when

nonsacred? And (2) does a violation *with* pathogens elicit feelings of disgust or being grossed-out more when the violation is sacred than when nonsacred. We compared sacred with nonsacred violations, both with and without pathogens.

To our knowledge, there is only a single study that recognized issues with confounding sacred violations with pathogens and with the use of the word *disgust* as the measure of core disgust. Royzman, Atanasov, Landy, Parks, and Gepty (2014) studied sacred violations free of pathogens and relied on measures such as behavioral reactions (oral inhibition vs. retaliation), facial expressions (anger vs. disgust faces), and emotion labels (anger vs. grossed out) rather than only the word *disgust*. They found that sacred violations free of pathogens were angering and not associated with core disgust.

Although Royzman et al.'s (2014) findings are based on a single study, they raise a strong challenge to the large number of prior studies said to support the single purity domain theory. Our present study complements Royzman et al. (2014) and extends it to the domain of morality. Royzman et al. (2014) recruited only American participants in their studies. Yet, the theory of a single purity domain was inspired by anthropological studies of India (Shweder, Mahapatra, & Miller, 1987; Shweder, Much, Mahapatra, & Park, 1997). Indeed, proponents of the single purity domain theory suggested that the expansion of disgust from pathogen to sacred issues is more evident in a non-Western culture, because, in a Western (independent-self) culture, people might moralize a sacred violation as a violation of individual rights and thus find the violation angering rather than disgusting (Haidt, 2012; Rozin & Haidt, 2013). Empirical findings do provide some support for this view: Eastern participants showed stronger divinity concerns than did Western participants (Graham et al., 2011; Jensen, 1998; Kim, Kang, & Yun, 2012; Vasquez, Keltner, Ebenbach, & Banaszynski, 2001). People who are less Westernized treat many issues related to food, sex, clothing, and prayer as moral issues (Graham, Haidt, & Nosek, 2009; Haidt et al., 1993). There is a stronger emphasis on the ethics of autonomy in the United States than in India or in Taiwan (Miller, 1997; Vauclair & Fischer, 2011). Religiosity plays a greater role in the lives of Eastern participants than in the lives of Western participants (Stankov & Lee, 2016). Therefore, a non-Western sample is important for a more robust test of the hypothesis that violations of the sacred elicit disgust. In the studies reported here, we recruited participants in India as well as in the United States.

Yet another criticism raised is that Royzman et al. (2014) did not examine the correlation between judged disgust and judged immorality. First, they did not obtain morality judgments, and, second, their findings were based on mean emotion ratings rather than individual differences. According to some theorists (Rottman, Kelemen, & Young, 2015; Rottman, Young, & Kelemen, 2017; Scott, Inbar, & Rozin, 2016), even when participants' mean rating is significantly greater for anger than for disgust, correlations reveal that the extent to which someone finds a violation disgusting predicts their judgment of its immorality, whereas the same is not true for finding the violation angering.

We further propose a more rigorous method to test the single domain theory. Royzman et al. (2014) modeled their method after that of Rozin, Lowery, et al. (1999), who used different stories to present different moral domains. Using different stories to present different domains raises potential confounds of domain with spe-

cifics of the action and circumstances (Hutcherson & Gross, 2011). Thus, the reported emotional reaction to these different stories may indicate not specificity of moral domain, but the details of the content of the stories. In the method we propose here, we establish a baseline of a violation that is free both of pathogens and of issues related to the sacred. To this baseline, in one condition, we add pathogen exposure, and the prediction is increased feelings of core disgust. In another condition, we add a violation of the sacred to the baseline, and examine whether the emotional reaction is the same core disgust as found for adding pathogen exposure. To examine the effect of a violation of the sacred in the context of exposure to pathogens, we also included a condition in which both pathogens and sacred were added to the baseline. In short, we propose a  $2 \times 2$  design with sacred/nonsacred crossed with pathogen/nonpathogen.

We used 12 story frames—eight story frames in Study 1 and four different ones in Study 2. Within each story frame were four versions: nonsacred nonpathogen (control), sacred nonpathogen, nonsacred pathogen, and sacred pathogen. We created four different story sets such that within each story set, condition (sacred and pathogen) was a within-subjects variable and story frame was a between-subjects variable. That is, for Study 1, within each story set, the eight stories represented the four conditions—two stories for each condition. For Study 2, within each story set, the four stories represented the four conditions—one each of each condition. For any one story frame, the four conditions appeared in the four different story sets. Studies 1 and 2 were approved by the Boston College Internal Review Board.

### Study 1: Observer Witnesses of Sacred Violations

Participants read eight stories and for each story rated the intensity of disgust, grossed out, anger, contempt, sadness, fear, shame, guilt, embarrassment, and happiness that an observer of the violation would feel.

### Method

**Participants.** Participants ( $N = 160$ ) were undergraduate students from two cultural groups: 80 Americans were native English speakers (62 women, 18 men; 69 Christians, 2 Jews, 9 nonreligious;  $M_{\text{age}} = 19.11$  years, range: 18–22 years) and 80 Indians were native Malayalam speakers (60 women, 20 men; 54 Christians, 21 Hindus, 5 Muslims;  $M_{\text{age}} = 19.69$  years, range: 18–27 years). Americans were recruited from Boston College in the United States and received course credit for their participation. Indians were recruited from St. Xavier's College, Thumba, India and participated voluntarily.

Our Indian sample was from the South Indian state of Kerala where large populations of Hindus, Christians, and Muslims live together; thus, people are more generally familiar with the religious practices of all three of these religions (Alagarajan, 2003; Dempsey, 2001). We also recruited participants from a Catholic college, hoping to recruit more Christians keeping in mind that many of the sacred violations in our stories involved violation of Christian religious norms, and also to have a better match for the American sample.

**Story frames.** The two independent variables—sacred versus nonsacred and pathogen versus nonpathogen—were varied to cre-

ate four versions of each story frame: sacred moral violation involving pathogen, sacred moral violation free of pathogen, nonsacred moral violation involving pathogen and nonsacred moral violation free of pathogen. There were eight such story frames and each story frame described an observer—Sam—knowing about a moral violation by someone else.

Thus, the nonpathogen/nonsacred was a baseline condition to which we added a pathogen element, a sacred element, or both. For example, a protagonist using a precious piece of art as a doorstep was nonpathogen/nonsacred violation, urinating on a precious piece of art was pathogen/nonsacred violation, using a large silver crucifix as a doorstep was nonpathogen/sacred violation, and urinating on a large silver crucifix was pathogen/sacred violation.

Appendix A shows all four versions of the questionnaire.

**Manipulation check for stories.** A preliminary question is whether each story had the attributes intended.

To answer this question, a preliminary study had 32 between-subjects conditions—8 story frames  $\times$  4 versions—with 20 participants in each version. Six hundred forty Americans (397 women, 243 men;  $M_{\text{age}} = 36.94$  years, range: 18–64 years) were recruited through Amazon Mechanical Turk. Each participant was randomly assigned to receive one of 32 stories. After reading the story, participants answered two questions: (1) whether the protagonist Sam thought that his acquaintance was encountering threats to his health, perhaps endangering his well-being, perhaps leading to sickness, and (2) whether the protagonist Sam thought that his acquaintance was violating a religious rule, showing disrespect for his religion. Participants indicated their response by clicking “yes” or “no.” For any scale that was clicked “yes,” the participant was asked to show how much with a 7-point scale (ranging from 1 = *a tiny degree* to 7 = *extremely*). Thus, the possible range of score for each response scale was 0 to 7, with 0 if the acquaintance was not encountering a threat to health or did not violate a religious rule, and the score on the rating scale if the acquaintance encountered a threat to health or violated a religious rule.

Participants agreed that the pathogen stories depicted a threat to health more than did nonpathogen stories and that sacred stories depicted a violation of religious norms more than did nonsacred stories. This pattern was confirmed by an analysis of variance with pathogen/nonpathogen and sacred/nonsacred as the between-subject variable on threat-to-health ratings and religious-norm-violation rating separately. For the threat-to-health rating, there was a significant main effect for pathogen/nonpathogen,  $F(1, 636) = 73.61, p < .001$ , but not for sacred/nonsacred,  $F(1, 636) = 0.97, p = .324$ , and no significant Pathogen/Nonpathogen  $\times$  Sacred/Nonsacred interaction,  $F(1, 636) = 0.24, p = .622$ . Threat-to-health rating for pathogen stories ( $M = 3.04, SD = 2.62$ ) was significantly greater than for nonpathogen stories ( $M = 1.41, SD = 2.16$ ), and the ratings did not significantly differ between sacred stories ( $M = 2.13, SD = 2.52$ ) and nonsacred stories ( $M = 2.32, SD = 2.55$ ).

For the religious-norm-violation rating, there was a significant main effect for sacred/nonsacred,  $F(1, 636) = 128.37, p < .001$ , but not for pathogen/nonpathogen,  $F(1, 636) = 0.32, p = .570$ , and no significant Sacred/Nonsacred  $\times$  Pathogen/Nonpathogen interaction,  $F(1, 636) = 1.87, p = .172$ . Religious-norm-violation rating for sacred stories ( $M = 3.71, SD = 2.80$ ) was significantly greater than for nonsacred stories ( $M = 1.40, SD = 2.31$ ), but the

rating did not significantly differ between pathogen stories ( $M = 2.61$ ,  $SD = 2.85$ ) and nonpathogen stories ( $M = 2.50$ ,  $SD = 2.78$ ).

Analysis for each story frame separately found the same pattern, even though not all of them were statistically significant. See Table S1 in the online supplemental materials for details. Within five of the eight story frames, threat-to-health rating for the pathogen condition was significantly greater than for the nonpathogen condition. Within seven of the eight story frames, the religious-norm-violation rating for sacred condition was significantly greater than for the nonsacred condition. A lack of statistically significant difference in each of the other cases—three story frames for threat-to-health rating and one story-frame for religious-norm-violation rating—is, perhaps, because the  $N$  for each story was modest but especially because the design was between subjects. Participants did not make the direct comparison between, for example, pathogens and no pathogens.

**Emotion response scale.** The response format had 10 emotions: disgust, grossed out, anger, contempt, sadness, fear, shame, guilt, embarrassment, and happiness. Participants could choose as many or as few emotions as they wanted by circling “yes” or “no” for each. For any emotion that was circled “yes,” the participant was asked to rate its intensity with a 7-point scale (ranging from 1 = *barely* to 7 = *extremely*). Thus, the possible range of scores for each emotion was 0 to 7, with 0 when emotion was not felt and the score on the intensity scale if the emotion was felt.

**Immorality scale.** For each story, there was a 7-point Likert scale (ranging from 1 = *not at all* to 7 = *extremely*) to rate the immorality of the behavior of the protagonist.

**Religion and strength of religious affiliation.** For each questionnaire, participants indicated their religious affiliation and, on a 7-point Likert scale (ranging from 1 = *very weak* to 7 = *very strong*), the strength of their affiliation.

**Design.** The design was a Latin square such that each participant was given two stories for each of the four conditions: sacred pathogen, sacred nonpathogen, nonsacred pathogen, and nonsacred nonpathogen. Across the four sets of questionnaires, condition was a between-subjects variable for each story frame.

There were eight versions of the questionnaire as the four sets of questionnaires were presented in two orders (one fixed order chosen randomly and a reversed order). The order of the stories had no significant effect on emotion ratings. Independent-sample  $t$  tests, on each of the emotion ratings separately and for each story separately, showed no significant differences for the story-order (random vs. reversed),  $ps > .126$ . Therefore, story order was ignored in analyses.

**Procedure.** Each participant was randomly assigned to receive one of eight versions of the questionnaire. Participants were asked to read each story and indicate the emotional reaction of the observer—Sam—toward the protagonist in the story, using the emotion response scale. Next, for each story, participants completed the immorality scale. After responding to all eight stories, participants answered the demographic questions.

**Analysis.** For the outcome variables of immorality, disgust, grossed out, and anger ratings, we conducted an analysis of variance with sacred (sacred vs. nonsacred), pathogen (pathogen vs. nonpathogen), and culture (American vs. Indian) as fixed factors. The effect of story was neglected because of using a Latin square design where each participant was given two stories for each of the

four conditions (Armitage, Berry, & Matthews, 2002; Kuehl, 2000).

## Results and Discussion

**Religiosity.** American participants were moderately religious, whereas Indians participants were highly religious. In single-sample  $t$  tests, for American participants, religiosity rating was not significantly different from the midpoint of the response scale (3.5), which would be moderately religious: American ( $M = 3.38$ ,  $SD = 1.70$ ),  $t(79) = -0.66$ ,  $p = .513$ . For Indians, religiosity rating was significantly greater than the midpoint of the response scale: Indian ( $M = 6.05$ ,  $SD = 1.27$ ),  $t(79) = 17.93$ ,  $p < .001$ . In an independent-sample  $t$  test, Indian participants were significantly more religious than American participants,  $t(158) = 11.26$ ,  $p < .001$ . See the online supplemental materials for further analysis on religiosity.

**Immorality.** Participants overall judged sacred violations to be more immoral than nonsacred violations, and violations involving pathogens to be more immoral than violations free of pathogens. Indian participants found violations in general to be more immoral than did American participants. In an analysis of immorality rating, there was a significant main effect for sacred/nonsacred,  $F(1, 1271) = 16.57$ ,  $p < .001$ ,  $\eta^2 = .01$ , for pathogen/nonpathogen,  $F(1, 1271) = 31.37$ ,  $p < .001$ ,  $\eta^2 = .02$ , and for culture,  $F(1, 1271) = 107.02$ ,  $p < .001$ ,  $\eta^2 = .08$ . The two-way and the three-way interactions were not significant,  $F_s(1, 1271) < 0.89$ ,  $ps > .343$ . Immorality ratings for sacred stories ( $M = 4.86$ ,  $SD = 1.87$ ) was significantly greater than for nonsacred stories ( $M = 4.44$ ,  $SD = 1.99$ ), for pathogen stories ( $M = 4.94$ ,  $SD = 1.84$ ) was significantly greater than for nonpathogen stories ( $M = 4.37$ ,  $SD = 2.00$ ), and for Indian participants ( $M = 5.19$ ,  $SD = 1.84$ ) was significantly greater than for American participants ( $M = 4.12$ ,  $SD = 1.89$ ).

**Disgust, grossed out, and anger as a function of conditions.** Next, in a set of analyses we examined whether disgust, anger, and grossed out were responsive to pathogen exposure and sacred violation. By a prediction of a single moral domain, both disgust and grossed out should be responsive to pathogen exposure as well as sacred violation. (See the online supplemental materials for correlation between disgust, anger, and grossed-out ratings and manipulation ratings with stories as cases.)

**Disgust.** Disgust was responsive to both sacred violation and pathogen presence for both Americans and Indians. Participants rated disgust significantly greater for sacred than nonsacred, and significantly greater for pathogen than nonpathogen stories. In an analysis of disgust rating, there was a significant main effect for sacred/nonsacred,  $F(1, 1271) = 8.31$ ,  $p = .004$ ,  $\eta^2 = .01$ , for pathogen/nonpathogen,  $F(1, 1271) = 57.58$ ,  $p < .001$ ,  $\eta^2 = .04$ , and for culture,  $F(1, 1271) = 138.90$ ,  $p < .001$ ,  $\eta^2 = .10$ . There was also a significant Pathogen/Nonpathogen  $\times$  Culture interaction,  $F(1, 1271) = 7.25$ ,  $p = .007$ ,  $\eta^2 = .01$ . Each of the other interactions were not significant,  $F_s(1, 1271) < 1.08$ ,  $ps > .299$ . Disgust ratings for sacred stories ( $M = 3.14$ ,  $SD = 2.84$ ) was significantly greater than for nonsacred stories ( $M = 2.71$ ,  $SD = 2.82$ ), for pathogen stories ( $M = 3.48$ ,  $SD = 2.83$ ) was significantly greater than for nonpathogen stories ( $M = 2.37$ ,  $SD = 2.74$ ), and for American participants ( $M = 3.79$ ,  $SD = 2.58$ ) was significantly greater than for Indian participants ( $M = 2.06$ ,  $SD =$

2.83). Follow-up analysis of the significant Pathogen/Nonpathogen  $\times$  Culture interaction compared—independent-sample  $t$  tests—the disgust rating between pathogen versus nonpathogen stories for American and Indian participants separately. However, both for American and Indian participants, disgust ratings for pathogen stories was significantly greater than for nonpathogen stories: American—pathogen ( $M = 4.55$ ,  $SD = 2.27$ ) and nonpathogen ( $M = 3.04$ ,  $SD = 2.64$ ),  $t(638) = 7.78$ ,  $p < .001$ , and Indian—pathogen ( $M = 2.42$ ,  $SD = 2.94$ ) and nonpathogen ( $M = 1.70$ ,  $SD = 2.68$ ),  $t(638) = 3.25$ ,  $p = .001$ .

**Anger.** Anger, largely similar to the pattern for disgust, was responsive to both sacred violation and pathogen presence for both Americans and Indians. Participants rated anger significantly greater for sacred than nonsacred, and significantly greater for pathogen than nonpathogen violations. In an analysis of the anger rating, there was a significant main effect for sacred/nonsacred,  $F(1, 1271) = 34.67$ ,  $p < .001$ ,  $\eta^2 = .03$ , and for pathogen/nonpathogen,  $F(1, 1271) = 11.26$ ,  $p = .001$ ,  $\eta^2 = .02$ , but not for culture,  $F(1, 1271) = 1.45$ ,  $p = .229$ . The two-way and the three-way interactions were not significant,  $F_s(1, 1271) < 2.44$ ,  $ps > .119$ . Anger ratings for sacred stories ( $M = 3.64$ ,  $SD = 2.61$ ) was significantly greater than for nonsacred stories ( $M = 2.77$ ,  $SD = 2.71$ ), and for pathogen stories ( $M = 3.45$ ,  $SD = 2.73$ ) was significantly greater than for nonpathogen stories ( $M = 2.96$ ,  $SD = 2.64$ ), but ratings did not significantly differ between American participants ( $M = 3.12$ ,  $SD = 2.45$ ) and Indian participants ( $M = 3.29$ ,  $SD = 2.91$ ).

**Grossed out.** Because disgust overlaps in meaning with both anger and core disgust, a clearer measure of core disgust is grossed out. Grossed out was responsive to pathogen presence, but not sacred violation for both Americans and Indians. Participants rated grossed out significantly greater for pathogen than nonpathogen violations, but not significantly differently for sacred and nonsacred violations. In an analysis of grossed-out ratings, there was a significant main effect for pathogen/nonpathogen,  $F(1, 1271) = 252.55$ ,  $p < .001$ ,  $\eta^2 = .17$ , and for culture,  $F(1, 1271) = 14.75$ ,  $p < .001$ ,  $\eta^2 = .01$ , but not for sacred/nonsacred,  $F(1, 1271) = 0.12$ ,  $p = .725$ . The two-way and the three-way interactions were not significant,  $F_s(1, 1271) < 2.43$ ,  $ps > .119$ . Grossed-out ratings did not significantly differ between sacred stories ( $M = 2.36$ ,  $SD = 2.79$ ) and nonsacred stories ( $M = 2.31$ ,  $SD = 2.81$ ), but ratings for pathogen stories ( $M = 3.46$ ,  $SD = 2.81$ ) was significantly greater than for nonpathogen stories ( $M = 1.20$ ,  $SD = 2.28$ ), and ratings for American participants ( $M = 2.61$ ,  $SD = 2.77$ ) was significantly greater than for Indian participants ( $M = 2.06$ ,  $SD = 2.79$ ).

Figure 1 shows grossed-out ratings in each of the four conditions. Grossed out was responsive to pathogen exposure, but not sacred violations.

**Emotion predicting immorality.** According to the critique of Rottman et al. (2017) and Scott et al. (2016), for a sacred violation, even when anger is the predominant emotional reaction, individual differences in core disgust rather than in anger predict the judged immorality of the violation. We found no evidence that individual differences in core disgust predicted the moral condemnation of pathogen-free sacred violations: We conducted a regression analysis predicting immorality from disgust, anger, and grossed out, for each cultural group separately. Both disgust and anger, but not grossed out, significantly predicted immorality for each of the

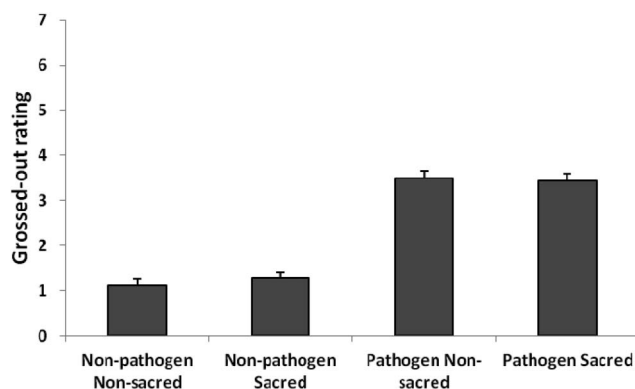


Figure 1. Grossed-out rating in each of the four conditions in Study 1. Standard errors are represented in the figure by the error bars attached to each column.

cultural groups. For Americans: disgust,  $\beta = .24$ ,  $p < .001$ , anger,  $\beta = .22$ ,  $p = .001$ , and grossed out,  $\beta = .09$ ,  $p = .166$ ,  $R^2 = .34$ ,  $p < .001$ . For Indians: disgust,  $\beta = .13$ ,  $p = .020$ , anger,  $\beta = .20$ ,  $p < .001$ , and grossed out,  $\beta = -.01$ ,  $p = .976$ ,  $R^2 = .18$ ,  $p < .001$ .

**Multiple emotions.** Implicit in various theories of moral psychology is that each type of moral violation is linked to precisely one emotion; thus disgust is linked to sacred violations, anger to autonomy violations, and so on. An alternative theory predicts a more general negative emotional reaction to moral violations (Cameron et al., 2015; Gray & Keeney, 2015). To explore whether moral violations are linked to precisely one emotion or a range of negative emotions, we examined the full set of emotions (the emotion response scale consisted of 10 emotion labels). Table 1 shows the mean rating for each of the emotions in each condition. (See Table S3 in the online supplemental materials for a similar analysis within each story.)

Table 1 suggests a general negative emotional reaction to moral violations. In each of the conditions happiness was significantly lower than the other emotions, all of which were negative (with the only exception that in nonpathogen nonsacred control condition, happiness was not significantly different from guilt).

**Is the emotional impact of a sacred violation equivalent to that of exposure to a pathogen?** We now turn to our proposed test of the principal hypothesis. Our control condition—nonpathogen nonsacred—includes stories of some moral infraction. The first question is what happens when pathogen exposure—the same story but in the pathogen nonsacred condition—is added to that infraction. For each story, we examined the change of the emotion ratings by subtracting each emotion rating for the nonpathogen nonsacred condition from the emotion ratings for the pathogen nonsacred condition. For five of the emotions—grossed out, disgust, shame, anger, and embarrassment—adding pathogen exposure to the control stories increased the emotional impact. Dependent-sample  $t$  tests showed that these emotion ratings were greater in the pathogen nonsacred condition than in the nonpathogen nonsacred condition,  $ps < .033$ . The largest effect was for grossed out. In Figure 2, these five emotions are shown along the horizontal axis; the vertical axis shows the increment in the rating for each emotion.

Table 1  
*Mean (Standard Deviation) Rating for the Emotions for Each Condition, Study 1*

Emotion	Nonpathogen nonsacred	Pathogen nonsacred	Nonpathogen sacred	Pathogen sacred
Anger	<b>2.49<sup>a</sup></b> (2.62)	3.05 <sup>a</sup> (2.76)	<b>3.42<sup>a</sup></b> (2.58)	<b>3.86<sup>a</sup></b> (2.63)
Sadness	2.13 <sup>ab</sup> (2.43)	1.95 <sup>bc</sup> (2.42)	2.12 <sup>b</sup> (2.36)	1.97 <sup>bc</sup> (2.42)
Disgust	2.10 <sup>ab</sup> (2.70)	3.33 <sup>a</sup> (2.82)	2.63 <sup>b</sup> (2.77)	3.64 <sup>a</sup> (2.84)
Contempt	1.86 <sup>b</sup> (2.53)	2.09 <sup>bc</sup> (2.58)	2.40 <sup>b</sup> (2.65)	2.45 <sup>b</sup> (2.77)
Shame	1.60 <sup>bc</sup> (2.29)	2.17 <sup>bd</sup> (2.57)	2.08 <sup>b</sup> (2.39)	2.31 <sup>b</sup> (2.57)
Embarrassment	1.18 <sup>de</sup> (2.17)	1.57 <sup>c</sup> (2.47)	1.18 <sup>c</sup> (2.10)	1.45 <sup>c</sup> (2.27)
Grossed out	1.12 <sup>cde</sup> (2.25)	<b>3.50<sup>a</sup></b> (2.81)	1.29 <sup>c</sup> (2.31)	3.43 <sup>a</sup> (2.81)
Fear	.97 <sup>de</sup> (1.99)	.96 <sup>d</sup> (1.97)	.66 <sup>d</sup> (1.66)	.67 <sup>d</sup> (1.63)
Guilt	.45 <sup>f</sup> (1.35)	.29 <sup>e</sup> (1.16)	.42 <sup>d</sup> (1.27)	.41 <sup>d</sup> (1.29)
Happiness	.24 <sup>f</sup> (1.10)	.01 <sup>f</sup> (.08)	.09 <sup>e</sup> (.60)	.03 <sup>e</sup> (.43)

*Note.* Means on an 8-point Likert scale (0 = *no* to 7 = *extremely*). The mean values are the average across eight stories in each condition. Mean values in bold for each column indicate the modal emotion for a condition. Different subscripts on mean values for each column indicate a significant difference, based on paired-sample *t* tests with Bonferroni correction.

The next question was whether adding, instead of pathogen exposure, a violation of something sacred creates the same emotional impact as did adding pathogen exposure. We examined the increase of the same five emotion ratings by subtracting the emotion ratings for the nonpathogen nonsacred condition from the emotion ratings for the nonpathogen sacred condition. Results are also shown in Figure 2. The emotional reaction was not the same as what was observed for pathogen exposure. The largest impact was on anger, but there was a significant impact on disgust and shame ratings as well,  $ps < .014$ . Grossed out, the emotion that showed the largest effect when pathogen exposure was added, did not show a significant increase,  $p = .234$ .

Similarly, we examined the emotional impact of adding sacred violation within a pathogen-threat context: the emotional impact of adding a sacred violation to a pathogen violation. We examined the increase of the same five emotion ratings by subtracting the

emotion ratings for the pathogen nonsacred condition from the emotion ratings for the pathogen sacred condition. Results are shown in Figure 2. Anger showed a significant increase,  $p < .001$ . Grossed out and other emotions did not show a significant increase,  $ps > .095$ .

**Summary.** The same action was seen as more immoral when it violated a sacred norm, or when it involved pathogens, than it otherwise would be. Adding a violation of the sacred or adding pathogens also changed the emotional reaction to the violation. The precise nature of the emotional reaction, however, was not that generally assumed in the theory of a single distinct moral divinity/purity/sacred domain. Violations involving pathogens did not elicit the same emotional reaction as those involving the sacred. Violations involving pathogens were strongly associated with feeling grossed out, whereas violations without pathogens never had grossed out as the modal emotion. Violations of the sacred were

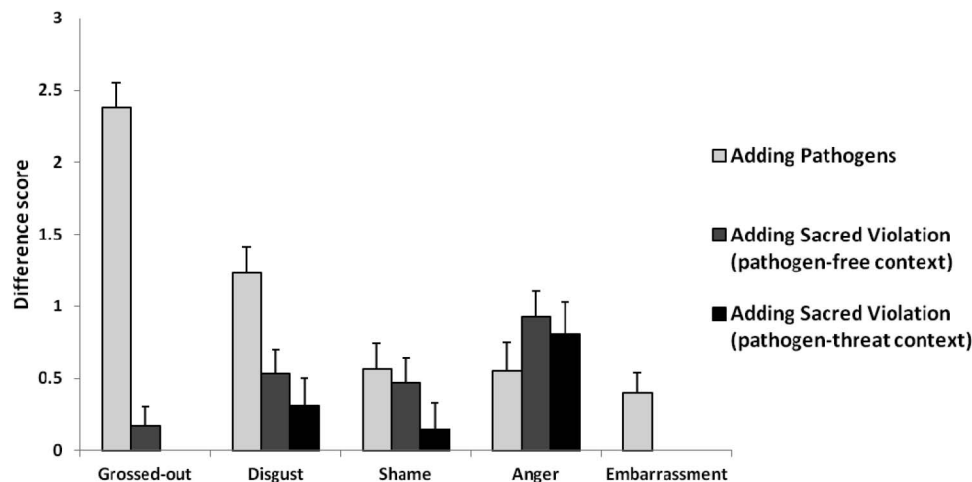


Figure 2. Difference in emotion ratings between conditions in Study 1. Adding pathogens = increase in emotion ratings in pathogen nonsacred condition from nonpathogen nonsacred condition. Adding sacred violation (pathogen-free context) = increase in emotion ratings in nonpathogen sacred condition from nonpathogen nonsacred condition. Adding sacred violation (pathogen-threat context) = increase in emotion ratings in pathogen sacred condition from pathogen nonsacred condition. Standard errors are represented in the figure by the error bars attached to each column.

not associated with grossed-out, unless pathogens were also present. Individual difference in rated grossed-out failed to predict the rated immorality of sacred (pathogen-free) violations. Sacred violations were associated with a range of negative emotions. The words anger and disgust were associated with both pathogen and sacred violations. Although the word disgust was used, as found in previous studies, its meaning was not that of grossed out, but more likely that of anger. This pattern can be interpreted as a challenge to the claim that sacred violations are part of a distinct domain in which the moral emotion is distinct from anger but is the same emotional reaction as that to disease-threatening events.

## Study 2: Participant Witnesses of Sacred Violations

Results from any one study may depend on the details of that study. We therefore extended this line of research with variations in details. Participants in Study 1 were less religious, but in Study 2 were preselected to be religious; thus providing a sample perhaps more responsive to violations of the sacred. In Study 1, manipulation checks showed that differences between conditions were mild: although the differences between the conditions were in the expected direction for each story frame, they were not statistically significant for some of them. In Study 2, differences were designed to be stronger. In Study 1, participants were asked to imagine how someone else (the protagonist Sam) would feel about the moral violation. This procedure was used to bypass the participant's individual religious orientation, but, it might be argued, this procedure examined the participant's conceptual beliefs about the linkages of emotions and moral violations rather than the participants' own experienced emotional reaction to the moral violation. In Study 2, participants were asked to give their own personal reaction.

In short, in Study 2, we used four new story frames intended to make the difference between the conditions stronger. The participants were asked about their own emotional reaction to the moral violation. To solve the problem of differences in religious orientation and to make the events relevant to the participants' own beliefs, all participants were Christians, and each of the sacred violations presented a violation of a Christian religious norm.

The method was the same as in Study 1 except as noted. The formats for rating emotion response and immorality were identical to that of Study 1, but the question now asked was about "you" rather than Sam. Similarly, the manipulation ratings (threat-to-health and religious-norm-violation) were identical to that of the pretest for Study 1, but again the question now asked was about you rather than Sam. Unlike Study 1, in which stories were presented in two orders (one fixed order chosen randomly and a reversed order), now we randomized separately for each participant the four stories in a questionnaire and the 10 emotion labels in the emotion response scale.

## Method

**Participants.** Participants ( $N = 240$ ) were different from those in Study 1: 120 Americans (60 women, 60 men;  $M_{\text{age}} = 36.27$  years, range: 19–64 years) and 120 Indians (58 women, 62 men;  $M_{\text{age}} = 27.61$  years, range: 18–58 years). All listed their religion as Christian. Americans were recruited through Mechanical Turk and were financially compensated. To achieve the num-

ber of 120 for Christians, we recruited 214 participants, but omitted the 94 non-Christians (their data were analyzed separately and are reported in the online supplemental materials). Indians, recruited through a snowball sampling procedure—the survey link was sent to our contacts who are Christians and they sent them to other potential participants who are Christians—participated voluntarily.

**Story frames.** There were four new story frames, different from those of Study 1. With four conditions for each story frame, there were 16 stories in all. Appendix B shows all four versions for each story frame.

**Manipulation check for stories.** Participants agreed that the pathogen stories depicted threat to health more than did nonpathogen stories, and that sacred stories depicted violation of religious norms more than did nonsacred stories. This conclusion was supported in analyses of variance with pathogen/nonpathogen, sacred/nonsacred, and culture as between-subjects variables on threat-to-health ratings and religious-norm-violation ratings separately. For threat-to-health ratings, there was a significant main effect for pathogen/nonpathogen,  $F(1, 952) = 119.59, p < .001, \eta^2 = .11$ , but not for sacred/nonsacred,  $F(1, 952) = 0.99, p = .320$ , or culture,  $F(1, 952) = 0.01, p = .977$ . The two-way and the three-way interactions were not significant,  $F_s(1, 952) < 2.90, p_s > .089$ . Threat-to-health ratings for pathogen stories ( $M = 2.31, SD = 2.70$ ) was significantly greater than for nonpathogen stories ( $M = 0.70, SD = 1.74$ ), but the ratings did not significantly differ between sacred stories ( $M = 1.58, SD = 2.48$ ) and nonsacred stories ( $M = 1.43, SD = 2.33$ ), and between American ( $M = 1.51, SD = 2.45$ ) and Indian ( $M = 1.50, SD = 2.36$ ) participants.

For religious-norm-violation ratings, there was a significant main effect for sacred/nonsacred,  $F(1, 952) = 1160.42, p < .001, \eta^2 = .55$ , and for pathogen/nonpathogen,  $F(1, 952) = 6.80, p = .009, \eta^2 = .01$ , but not for culture,  $F(1, 952) = 0.05, p = .815$ . There was also a significant Sacred  $\times$  Pathogen interaction,  $F(1, 952) = 3.93, p = .048, \eta^2 = .00$ . Each of the other interactions were not significant,  $F_s(1, 952) < 0.74, p_s > .391$ . Religious-norm-violation ratings for sacred stories ( $M = 5.17, SD = 2.37$ ) was significantly greater than for nonsacred stories ( $M = 0.62, SD = 1.72$ ), for pathogen stories ( $M = 3.07, SD = 3.12$ ) was significantly greater than for nonpathogen stories ( $M = 2.72, SD = 3.02$ ), but the rating did not significantly differ between American ( $M = 2.91, SD = 3.05$ ) and Indian ( $M = 2.88, SD = 3.10$ ) participants. Follow-up analysis of the significant Sacred  $\times$  Pathogen interaction compared—independent-sample  $t$  tests—the religious-norm-violation ratings between pathogen versus nonpathogen stories for sacred and nonsacred stories separately. Within sacred stories, religious-norm-violation ratings for pathogen stories ( $M = 5.47, SD = 2.16$ ) was significantly greater than for nonpathogen stories ( $M = 4.86, SD = 2.52$ ),  $t(478) = 2.85, p = .004$ , but within nonsacred stories, ratings did not significantly differ between pathogen stories ( $M = 0.67, SD = 1.79$ ) and nonpathogen stories ( $M = 0.58, SD = 1.67$ ),  $t(478) = 0.53, p = .598$ .

Analysis for each story frame separately found the same pattern: Within each story frame, the threat-to-health rating for the pathogen condition was significantly greater than for the nonpathogen condition, and the religious-norm-violation rating for the sacred condition was significantly greater than for the nonsacred condition. See Table S4 in the online supplemental materials for details.

**Design.** In a questionnaire, the order of the stories and the order of the emotion labels in the emotion response scale were randomized separately for each participant. So each participant received a different order of stories and a different order of emotion labels.

**Procedure.** Participants were instructed to read the story and imagine themselves in the situation. They were then asked, “How would you feel observing the actions of your acquaintance?” Participants indicated their emotional reaction using the emotion response scale. They were then asked, “How immoral is the behavior of this acquaintance?” Finally, they were asked, “Did you think that this acquaintance might be encountering threats to his health, perhaps endangering his well-being, perhaps leading to sickness?” “Did you think that this acquaintance was violating a religious rule, showing disrespect for religion?” This procedure was repeated for each story, after which participants answered the demographic questions.

## Results and Discussion

**Religiosity.** Participants reported themselves to be religious. In single-sample *t* tests, for participants in both cultural groups, religiosity rating was significantly greater than the midpoint of the response scale (3.5), which would be moderately religious: American ( $M = 4.53$ ,  $SD = 2.03$ ) and Indian ( $M = 6.19$ ,  $SD = 0.99$ ),  $t(119) > 5.52$ ,  $ps < .001$ . In an independent-sample *t* test, Indian participants were significantly more religious than American participants,  $t(238) = 8.07$ ,  $p < .001$ . See the online supplemental materials for further analysis on religiosity.

**Immorality.** Participants judged sacred violation to be more immoral than nonsacred violations, and violations involving pathogens to be more immoral than violations free of pathogens. In an analysis of immorality ratings, there was a significant main effect for sacred/nonsacred,  $F(1, 952) = 24.85$ ,  $p < .001$ ,  $\eta^2 = .02$ , and for pathogen/nonpathogen,  $F(1, 952) = 23.66$ ,  $p < .001$ ,  $\eta^2 = .02$ , but not for culture,  $F(1, 952) = 1.36$ ,  $p = .244$ . The two-way and the three-way interactions were not significant,  $F_s(1, 952) < 2.71$ ,  $ps > .100$ . Immorality ratings for sacred stories ( $M = 5.78$ ,  $SD = 1.47$ ) were significantly greater than for nonsacred stories ( $M = 5.27$ ,  $SD = 1.76$ ), and for pathogen stories ( $M = 5.77$ ,  $SD = 1.52$ ) were significantly greater than for nonpathogen stories ( $M = 5.27$ ,  $SD = 1.72$ ), but the ratings did not significantly differ between American ( $M = 5.58$ ,  $SD = 1.57$ ) and Indian ( $M = 5.46$ ,  $SD = 1.71$ ) participants.

**Disgust, grossed out, and anger as a function of conditions.** Similar to the analyses in Study 1, we examined whether disgust, anger, and grossed out are responsive to pathogen exposure and sacred violation. By a prediction of a single moral domain, both disgust and grossed out should be responsive to pathogen exposure as well as sacred violation. (See the online supplemental materials for regression analyses on disgust, anger, and grossed out as predicted by manipulation ratings—perception of threat-to-health and religious-norm-violation.)

**Disgust.** Disgust was responsive to both sacred violation and pathogen presence for both Americans and Indians. Participants rated disgust significantly greater for sacred than nonsacred, and significantly greater for pathogen than nonpathogen stories. In an analysis of disgust ratings, there was a significant main effect for sacred/nonsacred,  $F(1, 952) = 9.29$ ,  $p = .002$ ,  $\eta^2 = .01$ , for

pathogen/nonpathogen,  $F(1, 952) = 29.00$ ,  $p < .001$ ,  $\eta^2 = .03$ , and for culture,  $F(1, 952) = 60.24$ ,  $p < .001$ ,  $\eta^2 = .06$ . There was also a significant Pathogen/Nonpathogen  $\times$  Culture interaction,  $F(1, 952) = 4.88$ ,  $p = .027$ ,  $\eta^2 = .01$ . Each of the other interactions were not significant,  $F_s(1, 952) < 0.66$ ,  $ps > .416$ . Disgust ratings for sacred stories ( $M = 4.19$ ,  $SD = 2.66$ ) were significantly greater than for nonsacred stories ( $M = 3.70$ ,  $SD = 2.65$ ), for pathogen stories ( $M = 4.39$ ,  $SD = 2.48$ ) were significantly greater than for nonpathogen stories ( $M = 3.51$ ,  $SD = 2.77$ ), and for American participants ( $M = 4.58$ ,  $SD = 2.70$ ) were significantly greater than for Indian participants ( $M = 3.31$ ,  $SD = 2.48$ ). Follow-up analysis of the significant Pathogen/Nonpathogen  $\times$  Culture interaction compared—independent-sample *t* tests—the disgust ratings between pathogen versus nonpathogen stories for American and Indian participants separately. However, both for American and Indian participants, disgust ratings for pathogen stories were significantly greater than for nonpathogen stories: American—pathogen ( $M = 5.21$ ,  $SD = 2.37$ ) and nonpathogen ( $M = 3.96$ ,  $SD = 2.86$ ),  $t(478) = 5.19$ ,  $p < .001$ , and Indian—pathogen ( $M = 3.57$ ,  $SD = 2.32$ ) and nonpathogen ( $M = 3.05$ ,  $SD = 2.61$ ),  $t(478) = 2.31$ ,  $p = .021$ .

**Anger.** Anger, similar to the pattern for disgust, was responsive to both sacred violation and pathogen presence for both Americans and Indians. Participants rated anger significantly greater for sacred than nonsacred, and significantly greater for pathogen than nonpathogen violations. In an analysis of anger ratings, there was a significant main effect for sacred/nonsacred,  $F(1, 952) = 9.11$ ,  $p = .003$ ,  $\eta^2 = .01$ , and for pathogen/nonpathogen,  $F(1, 952) = 18.94$ ,  $p < .001$ ,  $\eta^2 = .02$ , but not for culture,  $F(1, 952) = 2.71$ ,  $p = .100$ . The two-way and the three-way interactions were not significant,  $F_s(1, 952) < 0.89$ ,  $ps > .345$ . Anger ratings for sacred stories ( $M = 4.83$ ,  $SD = 2.42$ ) were significantly greater than for nonsacred stories ( $M = 4.35$ ,  $SD = 2.59$ ), and for pathogen stories ( $M = 4.93$ ,  $SD = 2.44$ ) were significantly greater than for nonpathogen stories ( $M = 4.25$ ,  $SD = 2.55$ ), but the ratings did not significantly differ between American ( $M = 4.46$ ,  $SD = 2.67$ ) and Indian ( $M = 4.72$ ,  $SD = 2.35$ ) participants.

**Grossed out.** Because disgust overlaps in meaning with both anger and core disgust, a clearer measure of core disgust is grossed out. Grossed out was responsive to pathogen presence, but not sacred violation for either Americans or Indians. Participants rated grossed out significantly greater for pathogen than nonpathogen violations, but not significantly differently for sacred and nonsacred violations. In an analysis of grossed-out ratings, there was a significant main effect for pathogen/nonpathogen,  $F(1, 952) = 439.54$ ,  $p < .001$ ,  $\eta^2 = .32$ , but not for sacred/nonsacred,  $F(1, 952) = 0.13$ ,  $p = .722$ , and for culture,  $F(1, 952) = 1.20$ ,  $p = .274$ . There was a significant Pathogen/Nonpathogen  $\times$  Culture interaction,  $F(1, 952) = 9.11$ ,  $p = .003$ ,  $\eta^2 = .01$ . Each of the other interactions were not significant,  $F_s(1, 952) < 0.73$ ,  $ps > .392$ . Grossed-out ratings for pathogen stories ( $M = 4.67$ ,  $SD = 2.62$ ) were significantly greater than for nonpathogen stories ( $M = 1.36$ ,  $SD = 2.28$ ), but ratings did not significantly differ between sacred stories ( $M = 3.04$ ,  $SD = 2.96$ ) and nonsacred stories ( $M = 2.99$ ,  $SD = 2.96$ ), and between American ( $M = 3.10$ ,  $SD = 3.04$ ) and Indian ( $M = 2.93$ ,  $SD = 2.87$ ) participants. Follow-up analysis of the significant Pathogen/Nonpathogen  $\times$  Culture interaction compared—independent-sample *t* tests—the grossed-out ratings



between pathogen versus nonpathogen stories for American and Indian participants separately. However, both for American and Indian participants, grossed-out ratings for pathogen stories was significantly greater than for nonpathogen stories: American—pathogen ( $M = 4.52$ ,  $SD = 2.81$ ) and nonpathogen ( $M = 1.68$ ,  $SD = 2.59$ ),  $t(478) = 11.51$ ,  $p < .001$ , and Indian—pathogen ( $M = 4.82$ ,  $SD = 2.41$ ) and nonpathogen ( $M = 1.03$ ,  $SD = 1.88$ ),  $t(478) = 19.22$ ,  $p = .021$ .

Figure 3 shows grossed-out ratings in each of the four conditions. Grossed out was responsive to pathogens, but not sacred violations.

**Emotion predicting immorality.** As in Study 1, there was no support for the hypothesis that individual differences in core disgust predict the judged immorality of a sacred violation. In a regression analysis predicting immorality ratings from disgust, anger, and grossed out (for nonpathogen sacred violations), grossed out did not significantly predict immorality for either cultural group. For Americans, both disgust,  $\beta = .23$ ,  $p < .001$ , and anger,  $\beta = .24$ ,  $p < .001$ , but not grossed out,  $\beta = -.01$ ,  $p = .801$ , significantly predicted immorality  $R^2 = .50$ ,  $p < .001$ . For Indians, disgust significantly,  $\beta = .17$ ,  $p = .003$ , and anger marginally,  $\beta = .11$ ,  $p = .074$ , but not grossed out,  $\beta = .02$ ,  $p = .823$ , predicted immorality,  $R^2 = .15$ ,  $p < .001$ .

**Multiple emotions.** To explore whether moral violations are linked to precisely one emotion or a range of negative emotions, we examined the full set of emotions. Table 2 shows the mean rating for each of the emotions in each condition. Table 2 suggests a general negative emotional reaction to moral violations. In each of the conditions happiness was significantly lower than the other emotions. (See Table S6 in the online supplemental materials for a similar analysis within each story.)

**Is the emotional impact of a sacred violation equivalent to that of exposure to a pathogen?** We examined the emotional impact of adding pathogen exposure to the control condition. We examined the increase in ratings of the same five emotions examined in Study 1 by subtracting each rating for the nonpathogen nonsacred condition from that in the pathogen nonsacred condition. The obtained pattern, seen in Figure 4, was highly similar to that seen in Study 1: for grossed out, disgust, anger, and embarrassment ratings, adding pathogen exposure increased the emo-

tional impact, even though, unlike in Study 1, for shame the pathogen exposure did not lead to an increase. Independent-sample  $t$  tests on each of these emotions showed that these emotion ratings were significantly greater in the pathogen nonsacred condition than in the nonpathogen nonsacred condition,  $ps < .007$ . The largest effect, again as in Study 1, was for grossed out.

Similar to the results of Study 1, a violation of something sacred did not create the same emotional impact as did exposure to pathogens. We examined the increase of the emotion ratings by subtracting the emotion ratings for the nonpathogen nonsacred condition from the emotion ratings for the nonpathogen sacred condition. The pattern of emotional reaction was not similar to what was observed when pathogen exposure was added (see Figure 4). There was an impact in disgust and anger ratings,  $ps < .046$ . Grossed out, the emotion that showed the largest effect when pathogen exposure was added, did not show a significant increase,  $p = .478$ .

Similarly, we examined the emotional impact of adding sacred violation within a pathogen-threat context: the emotional impact of adding sacred violation to a pathogen violation. We examined the increase of the same five emotion ratings by subtracting the emotion ratings for the pathogen nonsacred condition from the emotion ratings for the pathogen sacred condition. Results are shown in Figure 2. Anger showed a significant increase,  $p < .001$ . Grossed out and other emotions did not show a significant increase,  $ps > .095$ .

**Summary.** The pattern of results of Study 2 was highly similar to that found in Study 1. Violations involving pathogens did not elicit the same emotional reaction as those involving the sacred. Violations involving pathogens were strongly associated with feeling grossed out, whereas violations of the sacred free of pathogens did not have grossed out as a predominant emotional reaction. Individual difference in rated grossed out failed to predict the rated immorality of sacred (pathogen-free) violations. Feeling grossed out or disgust did not significantly predict participant perception of religious norm violation. Again, as in Study 1, sacred violations were associated with a range of negative emotions.

## General Discussion and Conclusion

The two studies here tested the theory that witnessing violation of the sacred elicits an emotional reaction similar to that elicited by exposure to something putrid, to a disease-threatening event. The studies used story frames such that to a baseline of moral infraction in one condition, pathogen exposure was added; in another condition, a sacred violation was added. In Study 1, a set of stories presented violations in which the protagonist was the witness to the violations, and participants imagined the emotional reaction of the protagonist. In Study 2, a new set of stories presented the participant him or herself as witnessing the violations. In Study 1, religiosity of participants was not selected, but in Study 2 participants were preselected to be religious. Both studies had highly similar results showing that the emotional reaction to a sacred religious violation is not the same as that to simple threats to health, which we called core disgust and represented by the term grossed out.

The pattern of emotional reaction to pathogen exposure and sacred violations is markedly different. Pathogen exposure led to a predominant grossed out reaction, but a grossed out reaction to

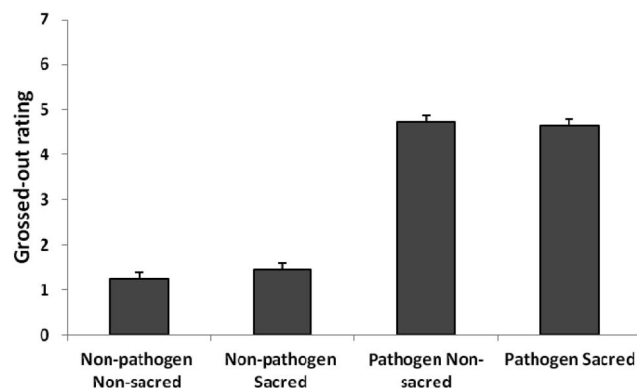


Figure 3. Grossed-out rating in each of the four conditions in Study 2. Standard errors are represented in the figure by the error bars attached to each column.

Table 2  
*Mean (Standard Deviation) Rating for the Emotions for Each Condition, Study 2*

Emotion	Nonpathogen nonsacred	Pathogen nonsacred	Nonpathogen sacred	Pathogen sacred
Anger	<b>4.03<sup>a</sup></b> (2.64)	4.67 <sup>a</sup> (2.51)	<b>4.47<sup>a</sup></b> (2.45)	<b>5.19<sup>a</sup></b> (2.35)
Shame	3.60 <sup>b</sup> (2.79)	3.92 <sup>b</sup> (2.83)	3.57 <sup>bc</sup> (2.71)	4.12 <sup>b</sup> (2.70)
Disgust	3.21 <sup>bc</sup> (2.74)	4.19 <sup>ab</sup> (2.47)	3.80 <sup>b</sup> (2.78)	4.59 <sup>b</sup> (2.48)
Embarrassment	3.07 <sup>bc</sup> (2.53)	3.67 <sup>bc</sup> (2.52)	3.19 <sup>c</sup> (2.63)	3.44 <sup>c</sup> (2.62)
Sadness	2.94 <sup>c</sup> (2.73)	3.08 <sup>c</sup> (2.90)	3.34 <sup>bc</sup> (2.83)	3.51 <sup>c</sup> (2.85)
Contempt	2.66 <sup>cd</sup> (2.80)	3.06 <sup>c</sup> (2.85)	2.99 <sup>c</sup> (2.77)	3.31 <sup>c</sup> (2.78)
Guilt	2.11 <sup>de</sup> (2.66)	2.13 <sup>d</sup> (2.62)	2.00 <sup>d</sup> (2.70)	1.99 <sup>d</sup> (2.65)
Fear	1.92 <sup>e</sup> (2.59)	2.22 <sup>d</sup> (2.72)	1.58 <sup>d</sup> (2.49)	1.92 <sup>d</sup> (2.69)
Grossed out	1.26 <sup>f</sup> (2.20)	<b>4.71<sup>a</sup></b> (2.61)	1.45 <sup>d</sup> (2.37)	4.63 <sup>ab</sup> (2.63)
Happiness	.17 <sup>g</sup> (.92)	.37 <sup>e</sup> (1.39)	.34 <sup>e</sup> (1.36)	.36 <sup>e</sup> (1.34)

*Note.* Means on an 8-point Likert scale (0 = *no* to 7 = *extremely*). The mean values are the average across eight stories in each condition. Mean values in bold for each column indicate the modal emotion for a condition. Different subscripts on mean values for each column indicate a significant difference, based on paired-sample *t* tests with Bonferroni correction.

sacred violation was insignificant. Individual differences in the rated grossed out failed to predict the rated immorality of sacred (pathogen-free) violations. Further analyses in the online supplemental materials showed that for sacred violation stories, participant perception of threat-to-health, but not religious-norm-violation was related to grossed out; strength of religiosity of the participant was not related to grossed out. Analysis for individual stories, again in the online supplemental materials, showed that in 10 of the 12 stories across Studies 1 and 2, for pathogen-free sacred violations, feeling grossed out was not different from feeling happiness.

Our findings are consistent with those of Royzman et al. (2014), who found that American participants' reactions to pathogen-free sacred violations did not show core disgust-related features such as nausea, gagging, loss of appetite, and a desire to move away. Additionally, we found that sacred violations not involving pathogens are not gross, even for Indians.

The Indian sample lends credence to the finding that sacred violations are not gross. Royzman et al.'s (2014) and our finding of a lack of a genuine core disgust reaction for pathogen-free sacred violations for Americans might be dismissed by saying that the divinity/purity/sacred domain is not salient in a Western culture. Previous findings provide some justification for such an explanation: Divinity moral concerns play a predominant role in daily life and religious life in India (Shweder et al., 1997). People who are less Westernized treat many issues related to food, sex, clothing, and prayer as moral issues (Graham et al., 2009; Haidt et al., 1993). Religiosity plays a greater role in the lives of Eastern participants than in the lives of Western participants (Stankov & Lee, 2016; see Abdel-Khalek & Lester, 2015; Clobert & Saroglou, 2015). Eastern participants showed stronger divinity concerns than did Western participants (Graham et al., 2011; Guerra, Giner-Sorolla, & Vasiljevic, 2013; Jensen, 1998; Kim et al., 2012; Vasquez et al., 2001).



Figure 4. Difference in emotion ratings between conditions in Study 2. Adding pathogens = increase in emotion ratings in pathogen nonsacred condition from nonpathogen nonsacred condition. Adding sacred violation (pathogen-free context) = increase in emotion ratings in nonpathogen sacred condition from nonpathogen nonsacred condition. Adding sacred violation (pathogen-threat context) = increase in emotion ratings in pathogen sacred condition from pathogen nonsacred condition. Standard errors are represented in the figure by the error bars attached to each column.

Our study also addressed Rottman et al.'s (2017) and Scott et al.'s (2016) criticism of the Royzman et al. (2014) study that their conclusions were based on mean emotion ratings rather than emotion-immorality correlations. Prior studies found that even when anger is modal, individual differences in disgust and not anger predict the immorality judgment of purity violations (Rottman, Kelemen, & Young, 2014). In both of our studies, the finding that individual differences in disgust predict the immorality judgment was replicated. However, two other findings raise questions about the criticisms. First, individual differences in anger were also found to predict immorality judgment. Second, and especially telling, individual differences in grossed out, a term representing core disgust, did not predict immorality judgments. In previous studies that showed a unique disgust-immorality correlation, the term disgust might have been used to indicate dislike or a general negative emotional reaction.

Characterization of the purity moral domain needs revision. Our findings challenge the current characterization of the purity moral domain as one domain that combines two distinct motivational systems: a disease avoidance mechanism and a mechanism for avoiding desecration of sacred values. More generally our findings also challenge views that characterize religion as an evolutionarily evoked disease-avoidance strategy (Terrizzi, 2017). There is no single emotional reaction underlying these distinct systems of disease avoidance and religion. A possible modification is that the purity moral domain consists of desecration of not all sacred values, but desecration of the sacredness of the self. In support of this view, Rottman et al. (2014) found a link between the disgust emotional reaction and condemnation of suicide: When reading suicide obituaries, a feeling of disgust significantly predicted moral condemnation of suicide. However, another study failed to replicate this finding with grossed out: feeling disgust, but not grossed out, significantly predicted condemnation of suicide (Kollareth, Allam, & Russell, 2017).

More generally, our findings did not support accounts that posit a unique link between one specific emotion and a particular kind of moral violation. In our study, participants indicated their emotional reaction using 10 emotion labels. Moral violations were associated with a range of negative emotions: Even though there were large variations among the negative emotion ratings, with one exception, each of them was rated above a positive emotion. Analysis for individual stories, in the online supplemental materials, showed that, across the stories, no one type of moral violation had a single emotional reaction as modal; instead, various emotions were modal. For each type of moral violation, there were various other negative emotions that were not significantly different from the modal emotions; other negative emotions were significantly greater than happiness. Thus, our findings cast doubt on accounts that separate moral violations by their association with discrete emotions such as disgust or anger (Graham et al., 2013; Rozin, Lowery, et al., 1999). Instead these findings are more consistent with a hypothesis proposed by Gray and colleagues (Cameron et al., 2015; Gray & Keeney, 2015; Schein, Ritter, & Gray, 2016) that all moral violations are associated with negative emotion, and the predominant emotion endorsed depends on the incidental details of the situation rather than the type of moral violation. Along the same lines, other findings have shown that observers respond to those who assault sacred values with moral

outrage which consists of feelings of anger, contempt, and disgust (Tetlock, 2003; Tetlock, Kristel, Elson, Green, & Lerner, 2000).

Our use of the emotion terms disgust and grossed out and the results inform a current debate in moral psychology on the nature of the emotion disgust. Is disgust in a moral context the same emotional reaction as disgust in a pathogen context? Some hold that these are the same emotional reaction—disgust initially evolved with the function of protecting oneself from toxins or pathogen-related things, but then was evolutionarily coopted to the moral domain (Chapman & Anderson, 2012; Rozin et al., 2009; Rozin et al., 2008). In our study, American participants used disgust—but not grossed out—for sacred violations that did not involve pathogens. In addition, they used the word disgust as they used anger. This finding points to the polysemous use of the word disgust in English. Prior studies had similarly showed that disgust is sometimes used to express anger or more generally a negative reaction of intense disapproval; in these cases, the word may not indicate the same emotion as experienced to putrid objects, core disgust (Herz & Hinds, 2013; Hutcherson & Gross, 2011; Kollareth & Russell, 2017; Nabi, 2002; Royzman & Kurzban, 2011; Rozin et al., 2008). Similarly, religious violation was associated with the word disgust, but not with a disgust facial expression that was elicited by physically disgusting stimuli (Ritter et al., 2016). Along the same lines, other findings show that an oral inhibition index measured with concrete physical events such as motion sickness differentiates the disgust related to dirty things from disgust related to anger (Royzman et al., 2008). Similarly, the face of someone about to vomit (open mouth, lowered bottom lip, cheeks raised), labeled the “sick face,” was more reliably associated with core disgust whereas the standard disgust face was sometimes associated with anger (Widen, Pochedly, Pieloch, & Russell, 2013).

Our studies were limited in many ways. We assessed emotions using emotion words. Perhaps other measures for emotion, such as facial expressions, neural measures, and physiological or behavioral reactions, would suggest a different conclusion. On the contrary, none of these other measures are consensually associated panculturally with a specific emotion, and advocates of a theory positing a specific emotion as a characteristic of a specific moral domain would need to show that the posited emotion can be assessed.

We should also note some limitations of our vignettes. We used only 12 story frames, and there could be many more norm violations to examine. Short stories are but one-dimensional shadows of the moral dilemmas encountered outside the psychology laboratory. Overall, in both Studies 1 and 2, our manipulation of the story frames was successful: participants agreed that the pathogen stories depicted threat to health more than did nonpathogen stories, and that religious stories depicted violation of religious norms more than did nonreligious stories. However, it might be argued, perception of threat to health and religious norm violations could be more extreme. Yet another issue was the lack of match between the conditions. In Study 2, pathogen sacred violations were perceived as more of a religious norm violation than nonpathogen sacred violation. However, in Study 1 and for non-Christians in Study 2, there was no such Sacred  $\times$  Pathogen interaction. Yet, the pattern of emotional reaction was similar across these three groups. It might be argued that the conditions were also poorly matched on immorality. In both Studies 1 and 2, participants judged sacred

violations to be more immoral than nonsacred violations, and violations involving pathogens to be more immoral than violations free of pathogens. Conditions that better match in immorality are ideal for a rigorous test of the hypothesis that sacred violations are disgusting. However, for non-Christians in Study 2 (results reported in the online supplemental materials), sacred and nonsacred violations were not significantly different in immorality, and violations involving pathogens were not significantly different from violations free of pathogens.

One line of argument that favors the unique link between a sacred violation and genuine core disgust has been that many religious norms attempt to achieve a symbolic purity through regulating behaviors related to food and sex and through cleansing rituals such as the Christian practice of baptism, Islamic practice of ablution before prayer, or the Hindu practice of bathing in the sacred river Ganges (Graham & Haidt, 2010; Looy, 2004; Preston & Ritter, 2012; Ritter & Preston, 2011). However, one can also think of counterexamples in which there is a complete negligence of cleanliness in order to get closer to the divine. A dramatic example is the Tantric religious discipline that involves inherently disgusting practices such as using a human skull as vessel for food or meditating on a decaying corpse (Ellis, 2011). There are also other such practices: in certain parts of south India devotees roll their bodies over scraps of food discarded by the priestly caste. Some Christians and the Shi'a sect of Islam practice self-flagellation. In different parts of the world, people do things such as impaling, hooking, and finger amputation to attain greater spiritual purity. In short, although the pursuit of the divine sometimes coincides with the pursuit of bodily health and cleanliness, it can sometimes coincide with threats to health and cleanliness. There is no simple single emotional reaction to all cases of the pursuit of the divine.

## References

- Abdel-Khalek, A. M., & Lester, D. (2015). Self-reported religiosity in Kuwaiti and American college students. *Psychological Reports, 116*, 986–989. <http://dx.doi.org/10.2466/17.PR0.116k31w4>
- Alagarajan, M. (2003). An analysis of fertility differentials by religion in Kerala state: A test of the interaction hypothesis. *Population Research and Policy Review, 22*, 557–574. <http://dx.doi.org/10.1023/B:POPU.0000020963.63244.8c>
- Armitage, P., Berry, G., & Matthews, J. N. S. (2002). *Statistical methods in medical research* (4th ed.). Malden, MA: Blackwell Science.
- Cameron, C. D., Lindquist, K. A., & Gray, K. (2015). A constructionist review of morality and emotions: No evidence for specific links between moral content and discrete emotions. *Personality and Social Psychology Review, 19*, 371–394. <http://dx.doi.org/10.1177/1088868314566683>
- Chapman, H. A., & Anderson, A. K. (2012). Understanding disgust. *Annals of the New York Academy of Sciences, 1251*, 62–76. <http://dx.doi.org/10.1111/j.1749-6632.2011.06369.x>
- Clobert, M., & Saroglou, V. (2015). Religion, paranormal beliefs, and distrust in science: Comparing East versus West. *Archive for the Psychology of Religions, 37*, 185–199. <http://dx.doi.org/10.1163/15736121-12341302>
- Curtis, V., & Biran, A. (2001). Dirt, disgust, and disease. Is hygiene in our genes? *Perspectives in Biology and Medicine, 44*, 17–31. <http://dx.doi.org/10.1353/pbm.2001.0001>
- Dempsey, C. G. (2001). *Kerala Christian sainthood: Collisions of culture and worldview in South India*. New York, NY: Oxford University Press. <http://dx.doi.org/10.1093/0195130286.001.0001>
- Ellis, T. B. (2011). Disgusting bodies, disgusting religion: The biology of Tantra. *Journal of the American Academy of Religion, 79*, 879–927. <http://dx.doi.org/10.1093/jaarel/lfr077>
- Fessler, D. M. T., Eng, S. J., & Navarrete, C. D. (2005). Elevated disgust sensitivity in the first trimester of pregnancy: Evidence supporting the compensatory prophylaxis hypothesis. *Evolution and Human Behavior, 26*, 344–351. <http://dx.doi.org/10.1016/j.evolhumbehav.2004.12.001>
- Graham, J., & Haidt, J. (2010). Beyond beliefs: Religions bind individuals into moral communities. *Personality and Social Psychology Review, 14*, 140–150. <http://dx.doi.org/10.1177/1088868309353415>
- Graham, J., Haidt, J., Koleva, S., Motyl, M., Iyer, R., Wojcik, S. P., & Ditto, P. H. (2013). Moral foundations theory: The pragmatic validity of moral pluralism. *Advances in Experimental Social Psychology, 47*, 55–130. <http://dx.doi.org/10.1016/B978-0-12-407236-7.00002-4>
- Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal of Personality and Social Psychology, 96*, 1029–1046. <http://dx.doi.org/10.1037/a0015141>
- Graham, J., Nosek, B. A., Haidt, J., Iyer, R., Koleva, S., & Ditto, P. H. (2011). Mapping the moral domain. *Journal of Personality and Social Psychology, 101*, 366–385. <http://dx.doi.org/10.1037/a0021847>
- Gray, K., & Keeney, J. E. (2015). Impure or just weird? Scenario sampling bias raises questions about the foundation of morality. *Social Psychological and Personality Science, 6*, 859–868. <http://dx.doi.org/10.1177/1948550615592241>
- Guerra, V. M., Giner-Sorolla, R., & Vasiljevic, M. (2013). The importance of honor concerns across eight countries. *Group Processes & Intergroup Relations, 16*, 298–318. <http://dx.doi.org/10.1177/1368430212463451>
- Haidt, J. (2003). Elevation and the positive psychology of morality. In C. L. M. Keyes & J. Haidt (Eds.), *Flourishing: Positive psychology and the life well-lived* (pp. 275–289). Washington, DC: American Psychological Association. <http://dx.doi.org/10.1037/10594-012>
- Haidt, J. (2012). *The righteous mind: Why good people are divided by politics and religion*. New York, NY: Pantheon/Random House.
- Haidt, J., Koller, S. H., & Dias, M. G. (1993). Affect, culture, and morality, or is it wrong to eat your dog? *Journal of Personality and Social Psychology, 65*, 613–628. <http://dx.doi.org/10.1037/0022-3514.65.4.613>
- Haidt, J., McCauley, C., & Rozin, P. (1994). Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors. *Personality and Individual Differences, 16*, 701–713. [http://dx.doi.org/10.1016/0191-8869\(94\)90212-7](http://dx.doi.org/10.1016/0191-8869(94)90212-7)
- Herz, R. S., & Hinds, A. (2013). Stealing is not gross: Language distinguishes visceral disgust from moral violations. *The American Journal of Psychology, 126*, 275–286. <http://dx.doi.org/10.5406/amerjpsyc.126.3.0275>
- Horberg, E. J., Oveis, C., & Keltner, D. (2011). Emotions as moral amplifiers: An appraisal tendency approach to the influences of distinct emotions upon moral judgment. *Emotion Review, 3*, 237–244. <http://dx.doi.org/10.1177/1754073911402384>
- Horberg, E. J., Oveis, C., Keltner, D., & Cohen, A. B. (2009). Disgust and the moralization of purity. *Journal of Personality and Social Psychology, 97*, 963–976. <http://dx.doi.org/10.1037/a0017423>
- Hutcherson, C. A., & Gross, J. J. (2011). The moral emotions: A social-functional account of anger, disgust, and contempt. *Journal of Personality and Social Psychology, 100*, 719–737. <http://dx.doi.org/10.1037/a0022408>
- Jensen, L. A. (1998). Moral divisions within countries between orthodoxy and progressivism: India and the United States. *Journal for the Scientific Study of Religion, 37*, 90–107. <http://dx.doi.org/10.2307/1388031>
- Kim, K. R., Kang, J., & Yun, S. (2012). Moral intuitions and political orientation: Similarities and differences between South Korea and the United States. *Psychological Reports, 111*, 173–185. <http://dx.doi.org/10.2466/17.09.21.PR0.111.4.173-185>

- Kollareth, D., Allam, A., & Russell, J. A. (2017). *On judging the immorality of someone having taken his or her own life*. Manuscript submitted for publication.
- Kollareth, D., & Russell, J. A. (2017). The English word *disgust* has no exact translation in Hindi or Malayalam. *Cognition and Emotion*, *31*, 1169–1180. <http://dx.doi.org/10.1080/02699931.2016.1202200>
- Kuehl, R. O. (2000). *Design of experiments: Statistical principles in research design and analysis*. Pacific Grove, CA: Duxbury Press.
- Looy, H. (2004). Embodied and embedded morality: Divinity, identity, and disgust. *Zygon*, *39*, 219–235. <http://dx.doi.org/10.1111/j.1467-9744.2004.00567.x>
- Marzillier, S. L., & Davey, G. C. L. (2004). The emotional profiling of disgust-eliciting stimuli: Evidence for primary and complex disgusts. *Cognition and Emotion*, *18*, 313–336. <http://dx.doi.org/10.1080/02699930341000130>
- Miller, B. D. (1997). *The endangered sex: Neglect of female children in rural North India*. New York, NY: Oxford University Press.
- Nabi, R. L. (2002). The theoretical versus the lay meaning of disgust: Implications for emotion research. *Cognition and Emotion*, *16*, 695–703. <http://dx.doi.org/10.1080/02699930143000437>
- Oaten, M., Stevenson, R. J., & Case, T. I. (2009). Disgust as a disease-avoidance mechanism. *Psychological Bulletin*, *135*, 303–321. <http://dx.doi.org/10.1037/a0014823>
- Olatunji, B. O., Tolin, D. F., Huppert, J. D., & Lohr, J. M. (2005). The relation between fearfulness, disgust sensitivity and religious obsessions in a non-clinical sample. *Personality and Individual Differences*, *38*, 891–902. <http://dx.doi.org/10.1016/j.paid.2004.06.012>
- Preston, J. L., & Ritter, R. S. (2012). Cleanliness and godliness: Mutual association between two kinds of personal purity. *Journal of Experimental Social Psychology*, *48*, 1365–1368. <http://dx.doi.org/10.1016/j.jesp.2012.05.015>
- Ritter, R. S., & Preston, J. L. (2011). Gross gods and icky atheism: Disgust responses to rejected religious beliefs. *Journal of Experimental Social Psychology*, *47*, 1225–1230. <http://dx.doi.org/10.1016/j.jesp.2011.05.006>
- Ritter, R. S., Preston, J. L., Salomon, E., & Relihan-Johnson, D. (2016). Imagine no religion: Heretical disgust, anger and the symbolic purity of mind. *Cognition and Emotion*, *30*, 778–796. <http://dx.doi.org/10.1080/02699931.2015.1030334>
- Rottman, J., Kelemen, D., & Young, L. (2014). Tainting the soul: Purity concerns predict moral judgments of suicide. *Cognition*, *130*, 217–226. <http://dx.doi.org/10.1016/j.cognition.2013.11.007>
- Rottman, J., Kelemen, D., & Young, L. (2015). Hindering harm and preserving purity: How can moral psychology save the planet? *Philosophy Compass*, *10*, 134–144. <http://dx.doi.org/10.1111/phc3.12195>
- Rottman, J., Young, L., & Kelemen, D. (2017). The impact of testimony on children's moralization of novel actions. *Emotion*, *17*, 811–827. <http://dx.doi.org/10.1037/emo0000276>
- Royzman, E. B., Atanasov, P. F., Landy, J. F., Parks, A., & Gepty, A. (2014). CAD or MAD? Anger (not disgust) as the predominant response to pathogen-free violations of the divinity code. *Emotion*, *14*, 892–907. <http://dx.doi.org/10.1037/a0036829>
- Royzman, E., & Kurzban, R. (2011). Minding the metaphor: The elusive character of moral disgust. *Emotion Review*, *3*, 269–271. <http://dx.doi.org/10.1177/1754073911402371>
- Royzman, E. B., Leeman, R. F., & Sabini, J. (2008). "You make me sick": Moral dyspepsia as a reaction to third-party sibling incest. *Motivation and Emotion*, *32*, 100–108. <http://dx.doi.org/10.1007/s11031-008-9089-x>
- Rozin, P., & Fallon, A. E. (1987). A perspective on disgust. *Psychological Review*, *94*, 23–41. <http://dx.doi.org/10.1037/0033-295X.94.1.23>
- Rozin, P., & Haidt, J. (2013). The domains of disgust and their origins: Contrasting biological and cultural evolutionary accounts. *Trends in Cognitive Sciences*, *17*, 367–368. <http://dx.doi.org/10.1016/j.tics.2013.06.001>
- Rozin, P., Haidt, J., & Fincher, K. (2009). Psychology. From oral to moral. *Science*, *323*, 1179–1180. <http://dx.doi.org/10.1126/science.1170492>
- Rozin, P., Haidt, J., & McCauley, C. R. (1999). Disgust: The body and soul emotion. In T. Dalgleish & M. J. Power (Eds.), *Handbook of cognition and emotion* (pp. 429–445). New York, NY: Wiley.
- Rozin, P., Haidt, J., & McCauley, C. R. (2008). Disgust. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions* (3rd ed., pp. 757–776). New York, NY: Guilford Press.
- Rozin, P., Haidt, J., & McCauley, C. R. (2009). Disgust: The body and soul emotion in the 21st century. In B. O. Olatunji & D. McKay (Eds.), *Disgust and its disorders: Theory, assessment, and treatment implications* (pp. 9–29). Washington, DC: American Psychological Association. <http://dx.doi.org/10.1037/11856-001>
- Rozin, P., Lowery, L., Imada, S., & Haidt, J. (1999). The CAD triad hypothesis: A mapping between three moral emotions (contempt, anger, disgust) and three moral codes (community, autonomy, divinity). *Journal of Personality and Social Psychology*, *76*, 574–586. <http://dx.doi.org/10.1037/0022-3514.76.4.574>
- Schaller, M., & Park, J. H. (2011). The behavioral immune system (and why it matters). *Current Directions in Psychological Science*, *20*, 99–103. <http://dx.doi.org/10.1177/0963721411402596>
- Schein, C., Ritter, R. S., & Gray, K. (2016). Harm mediates the disgust-immorality link. *Emotion*, *16*, 862–876. <http://dx.doi.org/10.1037/emo0000167>
- Scott, S. E., Inbar, Y., & Rozin, P. (2016). Evidence for absolute moral opposition to genetically modified food in the United States. *Perspectives on Psychological Science*, *11*, 315–324. <http://dx.doi.org/10.1177/1745691615621275>
- Shweder, R. A., Mahapatra, M., & Miller, J. G. (1987). Culture and moral development. In J. Kagan & S. Lamb (Eds.), *The emergence of morality in young children* (pp. 1–83). Chicago, IL: University of Chicago Press.
- Shweder, R. A., Much, N. C., Mahapatra, M., & Park, L. (1997). The "big three" of morality (autonomy, community, divinity) and the "big three" explanations of suffering. In A. M. Brandt & P. Rozin (Eds.), *Morality and health* (pp. 119–169). Florence, KY: Taylor & Francis/Routledge.
- Stankov, L., & Lee, J. (2016). Nastiness, morality and religiosity in 33 nations. *Personality and Individual Differences*, *99*, 56–66. <http://dx.doi.org/10.1016/j.paid.2016.04.069>
- Terrizzi, J. A. (2017). Is religion an evolutionarily evoked disease-avoidance strategy? *Religion, Brain & Behavior*, *7*, 328–330. <http://dx.doi.org/10.1080/2153599X.2016.1249918>
- Tetlock, P. E. (2003). Thinking the unthinkable: Sacred values and taboo cognitions. *Trends in Cognitive Sciences*, *7*, 320–324. [http://dx.doi.org/10.1016/S1364-6613\(03\)00135-9](http://dx.doi.org/10.1016/S1364-6613(03)00135-9)
- Tetlock, P. E., Kristel, O. V., Elson, S. B., Green, M. C., & Lerner, J. S. (2000). The psychology of the unthinkable: Taboo trade-offs, forbidden base rates, and heretical counterfactuals. *Journal of Personality and Social Psychology*, *78*, 853–870. <http://dx.doi.org/10.1037/0022-3514.78.5.853>
- Tybur, J. M., Lieberman, D., & Griskevicius, V. (2009). Microbes, mating, and morality: Individual differences in three functional domains of disgust. *Journal of Personality and Social Psychology*, *97*, 103–122. <http://dx.doi.org/10.1037/a0015474>
- Tybur, J. M., Lieberman, D., Kurzban, R., & DeScioli, P. (2013). Disgust: Evolved function and structure. *Psychological Review*, *120*, 65–84. <http://dx.doi.org/10.1037/a0030778>
- Vasquez, K., Keltner, D., Ebenbach, D. H., & Banaszynski, T. L. (2001). Cultural variation and similarity in moral rhetorics: Voices from the Philippines and the United States. *Journal of Cross-Cultural Psychology*, *32*, 93–120. <http://dx.doi.org/10.1177/0022022101032001010>

Vauclair, C., & Fischer, R. (2011). Do cultural values predict individuals' moral attitudes? A cross-cultural multilevel approach. *European Journal of Social Psychology, 41*, 645–657. <http://dx.doi.org/10.1002/ejsp.794>

Widen, S. C., Pochedly, J. T., Pieloch, K., & Russell, J. A. (2013). Introducing the sick face. *Motivation and Emotion, 37*, 550–557. <http://dx.doi.org/10.1007/s11031-013-9353-6>

## Appendix A

### The Four Versions for Each Story Frame in Study 1

#### Food

[Nonpathogen nonsacred] Sam is a devout Christian, who has an acquaintance who is also Christian. Sam knows that this acquaintance has high cholesterol and doctors have told him not to eat red meat. One day Sam sees him eating a dish prepared with red meat.

[Pathogen nonsacred] Sam is a devout Christian, who has an acquaintance who is also Christian. Sam knows that this acquaintance has high cholesterol and doctors have told him not to eat meat. One day Sam sees him eating a dish prepared with rotten red meat.

[Nonpathogen sacred] Sam is a devout Christian, who has an acquaintance who is also Christian. Their religion forbids them from eating meat on Holy Friday. One Holy Friday Sam sees his acquaintance eating a dish prepared with red meat.

[Pathogen sacred] Sam is a devout Christian, who has an acquaintance who is also Christian. Their religion forbids them from eating meat on Holy Friday. One Holy Friday Sam sees his acquaintance eating a dish prepared with rotten red meat.

#### Dress

[Nonpathogen nonsacred] Sam is a devout Christian and he along with a small group gets invited to attend a very unique opera, where people are expected to dress formally. One of Sam's acquaintances comes to the opera dressing very informally and carelessly.

[Pathogen nonsacred] Sam is a devout Christian and he along with a small group gets invited to attend a very unique opera, where people are expected to dress formally. One of Sam's acquaintances comes to the opera dressing very informally and carelessly and the acquaintance was stinking of sweat.

[Nonpathogen sacred] Sam is a devout Christian and he along with a small group gets invited to attend a very special worship in the Church, where people are expected to dress formally. One of Sam's acquaintances comes to the worship dressing very informally and carelessly.

[Pathogen sacred] Sam is a devout Christian and he along with a small group gets invited to attend a very special worship in the Church, where people are expected to dress formally. One of Sam's acquaintances comes to the worship dressing very informally and carelessly and the acquaintance was stinking of sweat.

#### Person

[Nonpathogen nonsacred] Sam comes to know of a 70-year-old man who has consensual sex with a 19-year-old girl.

[Pathogen nonsacred] Sam comes to know of a 70-year-old man who has consensual sex with a 19-year-old street girl, who is very dirty and stinking.

[Nonpathogen sacred] Sam comes to know of a 70-year-old priest who has consensual sex with a 19-year-old girl.

[Pathogen sacred] Sam comes to know that a 70-year-old priest who has consensual sex with a 19-year-old street girl, who is very dirty and stinking.

#### Behavior

[Nonpathogen nonsacred] Sam one day watches a drama group performing an art piece in an auditorium. As part of the act all participants act like animals and crawls around for 30 min.

[Pathogen nonsacred] Sam one day watches a drama group performing an art piece in an auditorium. As part of the act all participants act like animals for 30 min, including crawling around naked and urinating on stage.

[Nonpathogen sacred] Sam one day watches a drama group performing an art piece in an auditorium in the vicinity of a worship place. As part of the act all participants act like animals and crawls around for 30 min.

[Pathogen sacred] Sam one day watches a drama group performing an art piece in an auditorium in the vicinity of a worship place. As part of the act all participants act like animals for 30 min, including crawling around naked and urinating on stage.

*(Appendices continue)*

## Soul

[Nonpathogen nonsacred] Sam reads a story where a demon once appears to a writer and makes a deal with the writer for a huge sum of money. As per the deal the writer should sell his writing skills to the demon for the growth of the evil spirit in the world. The writer agrees and gets the money.

[Pathogen nonsacred] Sam reads a story where a dirty, stinking demon once appears to a writer and makes a deal with the writer for a huge sum of money. As per the deal the writer should sell his writing skills to the dirty, stinking demon for the growth of the evil spirit in the world. The writer agrees and gets the money.

[Nonpathogen sacred] Sam reads a story where a demon once appears to a writer and makes a deal with the writer for a huge sum of money. As per the deal the writer should sell his soul to the demon for the growth of the evil spirit in the world. The writer agrees and gets the money.

[Pathogen sacred] Sam reads a story where a dirty, stinking demon once appears to a writer and makes a deal with the writer for a huge sum of money. As per the deal the writer should sell his soul to the dirty, stinking demon for the growth of the evil spirit in the world. The writer agrees and gets the money.

## Object

[Nonpathogen nonsacred] Sam is a devout Christian. One day he visits one of his old friends from college. He finds out that his friend is having some serious disagreements with his father and as a protest he uses a precious piece of art, that he inherited from his father, as a doorstep.

[Pathogen nonsacred] Sam is a devout Christian. One day he visits one of his old friends from college. He finds out that his friend is having some serious disagreements with his father and as a protest he sometimes urinates on a precious piece of art that he inherited from his father.

[Nonpathogen sacred] Sam is a devout Christian. One day he visits one of his old friends from college. He finds out that his friend has since given up the faith and become an atheist and now the friend is using a large silver crucifix he inherited from his devout Christian father as a doorstep.

[Pathogen sacred] Sam is a devout Christian. One day he visits one of his old friends from college. He finds out that his friend has

since given up the faith and become an atheist and now the friend sometimes urinates on a large silver crucifix he inherited from his devout Christian father.

## Place

[Nonpathogen nonsacred] Sam one day while attending a seminar in the city hall, one of Sam's acquaintances came to attend the same seminar fully drunk.

[Pathogen nonsacred] Sam one day while attending a seminar in the city hall, one of Sam's acquaintances came to attend the same seminar fully drunk, he was stinking of alcohol.

[Nonpathogen sacred] Sam one day while attending a worship in the city Church, one of Sam's acquaintances came to the Church fully drunk.

[Pathogen sacred] Sam one day while attending a worship in the city Church, one of Sam's acquaintances came to the Church fully drunk, he was stinking of alcohol.

## Day

[Nonpathogen nonsacred] Sam is a member of an ethnic tribal group. The tribal community decided a day for social celebration and get together every year and conducts various cultural programs. One of Sam's acquaintances never participated in those events but spent this time collecting wild fruits.

[Pathogen nonsacred] Sam is a member of an ethnic tribal group. The tribal community decided a day for social celebration and get together every year and conducts various cultural programs. One of Sam's acquaintances never participated in those events but spent this time fishing in very dirty, stinking pond.

[Nonpathogen sacred] Sam is a member of an ethnic tribal group. The tribal community observes a day in a year as very sacred and wants everyone to be gathered together for worship and prayers. One of Sam's acquaintances never participated in those events but spent this time collecting wild fruits.

[Pathogen sacred] Sam is a member of an ethnic tribal group. The tribal community observes a day in a year as very sacred and wants everyone to be gathered together for worship and prayers. One of Sam's acquaintances never participated in those events but spent this time fishing in very dirty, stinking pond.

*(Appendices continue)*

## Appendix B

### The Four Versions for Each Story Frame in Study 2

#### Statue

[Nonpathogen nonsacred] You decide to take a walk one day with an acquaintance. On the way, the two of you come across a statue of George Washington. Next to the statue is a can of black paint. Your acquaintance decides to throw the black paint on the statue of George Washington.

[Pathogen nonsacred] You decide to take a walk one day with an acquaintance. On the way, the two of you come across a statue of George Washington. Next to the statue is a pile of feces. Your acquaintance decides to throw the feces on the statue of George Washington.

[Nonpathogen sacred] You decide to take a walk one day with an acquaintance. On the way, the two of you come across a statue of Jesus. Next to the statue is a can of black paint. Your acquaintance decides to throw the black paint on the statue of Jesus.

[Pathogen sacred] You decide to take a walk one day with an acquaintance. On the way, the two of you come across a statue of Jesus. Next to the statue is a pile of feces. Your acquaintance decides to throw the feces on the statue of Jesus.

#### Altar

[Nonpathogen nonsacred] You visit the state governor's mansion with an acquaintance. As you exit when no one is watching, your acquaintance throws vinegar on the living room carpet of the state governor's mansion.

[Pathogen nonsacred] You visit the state governor's mansion with an acquaintance. As you exit when no one is watching, your acquaintance urinates on the living room carpet of the state governor's mansion.

[Nonpathogen sacred] You visit a church with an acquaintance. As you are about to end your visit when no one is watching your acquaintance throws vinegar on the altar of the church.

[Pathogen sacred] You visit a church with an acquaintance. As you are about to end your visit when no one is watching your acquaintance urinates on the altar of the church.

#### Book

[Nonpathogen nonsacred] You visit a display of ancient books in the open air with an acquaintance. When no one was watching,

your acquaintance takes and tears up an ancient copy of the play, *Romeo and Juliet*. After tearing it up, the person throws the pieces of the book into a pool of water.

[Pathogen nonsacred] You visit a display of ancient books in the open air with an acquaintance. When no one was watching, your acquaintance takes and tears up an ancient copy of the play, *Romeo and Juliet*. After tearing it up, the person throws the pieces of the book into a sewer full of toilet waste.

[Nonpathogen sacred] You visit a display of ancient books in the open air with an acquaintance. When no one was watching, your acquaintance takes and tears up an ancient copy of the Holy Bible. After tearing it up, the person throws the pieces of the Bible into a pool of water.

[Pathogen sacred] You visit a display of ancient books in the open air with an acquaintance. When no one was watching, your acquaintance takes and tears up an ancient copy of the Holy Bible. After tearing it up, the person throws the pieces of the Bible into a sewer full of toilet waste.

#### Monument

[Nonpathogen nonsacred] Your acquaintance, one day when you were visiting him, dumps a truckload of construction material waste onto the courtyard of an ancient state-protected home of one of the founding fathers of the country.

[Pathogen nonsacred] Your acquaintance, one day when you were visiting him, dumps a truckload of infected hospital waste onto the courtyard of an ancient state-protected home of one of the founding fathers of the country.

[Nonpathogen sacred] Your acquaintance, one day when you were visiting him, dumps a truckload of construction material waste onto the courtyard of an ancient church that is believed to be established by one of Jesus' disciples.

[Pathogen sacred] Your acquaintance, one day when you were visiting him, dumps a truckload of infected hospital waste onto the courtyard of an ancient church that is believed to be established by one of Jesus' disciples.

Received February 16, 2017

Revision received December 13, 2017

Accepted December 19, 2017 ■