

“You make me sick”: Moral dyspepsia as a reaction to third-party sibling incest

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Abstract A pilot study and two main studies lent support to the hypothesis that appraisals of consensual sibling incest *as immoral* may directly engender the phenomenological state of oral inhibition (OI), comprised of nausea, gagging, and diminished appetite. More specifically, the findings indicate that (a) OI is a central component of a third-party reaction to sibling incest (significantly more so than anger or fear), (b) that it is produced specifically by the morally proscribed aspect of the incestuous relationship (sex between two individuals with common ancestry), and that (c) it is produced so directly rather than as a by-product of a more immediate emotional response (say, intense anger or fear). Furthermore, Study 2 found equal levels of OI for individuals with and without opposite-sex siblings, indicating that third-party aversion to consensual incest is, most likely, a function of the culturally transmitted information regarding the inherent wrongness of such acts.

Keywords Disgust · Nausea · Morality · Incest · Phenomenology

“The depth of his depravity sickens me.”
“Jerry Falwell”, *People vs. Larry Flynt*; Scott
Alexander and Larry Karaszewski

John Sabini is deceased.

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It is not uncommon for people to describe themselves as genuinely sickened by some aspect of another’s actions or character. What is unclear is how much psychological significance, if any, we are to ascribe to pronouncements such as these. One possibility is that these statements are of limited psychological import; on this view, when speaking of others as making us “sick,” leaving a “bad taste in our mouth,” or making us “want to puke,” we are speaking only figuratively and metaphorically. The theoretically intriguing alternative (henceforth the *moral dyspepsia hypothesis*) is that at least some such claims are to be taken literally, namely that an appraisal of certain proscribed acts (perhaps those with sexual overtones) as immoral may, in and of itself, trigger genuine gastrointestinal discomfort, not unlike that brought on by the consumption of foul-tasting foods or the smelling of fetid odors.

The alternative is a theoretically intriguing one for at least two reasons. First, the idea that certain types of moral misconduct can make us *physically ill* (*by virtue* of their immoral content) has been a part of the disgust literature for some time (Ekman 2003, p. 183; Shand 1920, p. 389) but has never been subject to a direct test (but see Rozin et al. 1999). Second, since nausea and gagging clearly did not evolve for the purpose of tracking and stamping infractions of the moral order, finding support for the moral dyspepsia hypothesis would offer fresh evidence for the bio-cultural mechanism of “exaptation,” defined as referring to “features that now enhance fitness, but were not built by natural selection for their current role” (Gould and Vrba 1982, p. 4; see also Gould 1991; Rozin and Fallon 1987). An example of exaptation is the mouth, which initially evolved for breathing and/or food-intake and then became co-opted for varieties of vocal expressions, including human speech. Closer to home, a recent literature review proposed that “the aversive emotional state of

social pain [especially, as it relates to social exclusion] is the same unpleasantness that is experienced in response to physical pain” (MacDonald and Leary 2005, p. 203; see also Eisenberger and Lieberman 2004).

Assuming a possible link between perceived immorality and gastrointestinal discomfort, the question is whether certain types of immoral acts are especially likely to evoke such a state. Sibling incest (e.g., Levi-Strauss 1969; Westermarck 1921; see Shepher 1983, for a review) appears to be a strong candidate for this role since, more than any other violation (sexual or otherwise), it has been linked consistently and specifically to reports of “disgust” (Fessler and Navarete 2004; Haidt 2001) and (posed or indexed) disgust facial expressions (Rozin et al. 1999), with the condemnation of the act being invariantly (or nearly invariantly) universal in nature (Brown 1991; Shepher 1983).

Validating the moral dyspepsia hypothesis

General outline

In our view, there are at least three basic requirements that a research project must meet in order for it to consider itself as having (provisionally) established the validity of the moral dyspepsia hypothesis with respect to sibling incest. *First*, it must be shown that the target phenomenological response is of the right kind, i.e., an experiential counterpart to food-related reactions of nausea (Angyal 1941; Haidt et al. 1997; Izard 1977; Nabi 2002; Shand 1920), gagging (Ekman 2003; see above), and diminished appetite (Royzman and Sabini 2001). *Second*, it must be demonstrated that this phenomenological response is engendered specifically by the moral properties of the stimulus in question, in this case consensual sex between two individuals of common ancestry, rather than by some other, morally unproblematic but potentially disgusting property of the target narrative (i.e., sex between co-reared individuals or sex as such). *Third*, it would have to be shown that, insofar as the perception of the morally proscribed act leads to gastrointestinal distress, it does so directly rather than as a by-product of a more immediate emotional response (say, intense anger). These three requirements are further elucidated below and were the subject of our initial investigations reported in Study 1. Study 2 was designed to replicate the findings of Study 1 as well as to test one plausible alternative to the moral dyspepsia hypothesis.

The three requirements for establishing the moral dyspepsia hypothesis

The first requirement, that the response in question be ‘of the right kind,’ appears to be the easiest to satisfy:

According to both anecdotal evidence and published literature (e.g., Fessler and Navarete 2004; Rozin et al. 1999), people are quite ready to denounce incest as “disgusting.” Keeping in mind that gustatory discomfort or *oral inhibition* has been a central component of the meaning of disgust since Darwin (1872/1965) (see also Nabi 2002), incest’s ability to elicit the oral inhibition reaction should be a matter of little controversy. However, there may be a crucial divergence between what an emotion term means to a lay person and its stipulated theoretical meaning (Nabi 2002; Royzman and Sabini 2001).

Consider, for example, a study in which undergraduates were asked to write a short essay describing a time when they felt either *angry*, *disgust*, *disgusted*, *revulsion*, or *grossed out*. The subsequent analysis revealed that “essays written in response to the word *disgust* and *disgusted* reflected anger levels equal to or greater than disgust levels...” (Nabi 2002, p. 701). In an earlier study, Vrana (1993) found that participants rated themselves as experiencing high levels of disgust during the anger images. Consistent with this finding, lay people appear to view “disgust” as a special case of “anger” (Russell and Fehr 1994) and a common lexical definition of disgust describes it as “a strong feeling of dislike, finding a thing very unpleasant, or against one’s principles” (Ehrlich et al. 1980) (see also Simpson et al. 2006 for a demonstration that moral disgust differs from “physical disgust” on a number of important dimensions in a manner consistent with some earlier predictions [Royzman and Sabini 2001]).

We found further evidence for the “disgust”/anger interplay in a pilot study in which fifteen undergraduates were presented with images of body waste (*Diaper*), gore (*Burn*), and moral iniquity (an archival photo of *Hitler* in full regalia). Embedded with the series was also a slide containing a description of a brother-sister incestuous relationship and two photographic images of gay kissing. In addition to being asked how “disgusted” and angry (ready to “lash out”) the slides made them feel, the participants were asked to rate their concrete, bodily sensations on a series of scales (though the “lash out” action tendency is a somewhat incomplete proxy for anger, it appears to individuate it most clearly with respect to oral inhibition and has been used in that manner on a previous occasion [e.g., Nabi 2002]). The 10-point scales comprising the highly internally consistent Oral Inhibition Index (Nausea, Gagging, Diminished Appetite) (all anchored in concrete physical events, e.g., motion sickness) were the main dependent measure. (More specifically, the positive endpoints for both Nausea and Diminished Appetite were elucidated as having “as much [of a sensation] as if you had a real motion sickness or a bad stomach flu,” while the endpoint for Gagging was equated to a sensation resulting from taking “a gulp of some really foul-tasting liquid”).

A number of interesting findings emerged: while the participants rated themselves as highly “disgusted” by *Hitler* ($M = 5$) as they were by *Diaper* ($M = 6$) ($p = 0.23$), the participants’ “disgusted” ratings in this case were unrelated to their reports of oral inhibition ($r = 0.26$, $p = 0.37$); on the other hand, their “disgusted” ratings did correlate highly with their reported desire to retaliate against someone ($r = 0.72$; $p = 0.04$). The pattern was just the reverse for *Burn*, *Diaper*, and *Incest*. (Other stimuli, such as the “reminder of animal origins” “news report,” arguing that humans are only slightly “remodeled chimps,” evoked mild “disgust,” but literally 0 oral inhibition). Thus, *with all due caution*, it does appear that the affective aftermath of reading about sibling incest may be in fact one of genuine gustatory discomfort that parallels the effects of exposure to the “core-disgusting” (Rozin et al. 1999) stimuli of body waste, (certain) animals, and unpalatable food.

This brings us to the second requirement. This would entail showing that the self-reported *oral inhibition* response arises specifically from that element of the narrative that is targeted by the moral prohibition (in this case, the act of sexual intimacy between two individuals related by blood) rather than through some other, morally extraneous (but physically disgusting) part of the description, i.e., ad hoc sex between two individuals with the shared experience of early upbringing or ad hoc sex as such. Controlling for potential non-moral sources of disgust embedded within a description of a moral violation (e.g., a vicious terrorist attack that leaves gore and dismemberment in its wake) is an ever-present methodological concern, since it is precisely stories of mass atrocities or extreme personal cruelty (the stories that are bound to contain or evoke the OI-conducive images of gore, dismemberment or the like) that are claimed to be among the most potent elicitors of socio-moral disgust (Ekman 2003; Miller 1997; Shand 1920). In our case, this general concern was compounded by the fact that some pilot questioning revealed that certain individuals were willing to describe “co-residential sex” (sex between two people who grew up together but were not genetically related) as “disgusting” even though they acknowledged that no moral laws were broken in this case. Given that co-residential sex is generally implicit in sibling sex, it was essential to establish that our participants’ aversion to incest as such was not simply an aversion to co-residential sex under a different name. Our strategy for exploring this possibility involved comparing oral inhibition reports for two closely matched scenarios: one describing sex between two siblings raised in the same home and another describing the same event between two individuals who share the siblings’ early history but not their genes.

Our remaining concern was to show that judgments of wrong regarding sibling incest evoke gastrointestinal discomfort *directly* rather than as a mere byproduct of a more intense first-order emotional response such as anger or fear.

Study 1

Method

Participants

Eighty-five participants (mean age = 19.77, $SD = 2.90$, 56.6% female) took part in the study. All participants were undergraduates recruited from a Social Psychology course.

Materials and procedure

At the beginning of a class-period, the students were asked to volunteer 5–7 min to complete a brief questionnaire. The participants were randomly assigned to receive a questionnaire containing one of the three variations of the “Julie and Mark” story (see below), adopted from Haidt (2001). The participants were asked to take note of the fact that the questionnaire was completely anonymous and were urged to respond as honestly and accurately as they could. The anonymity and a need for honest responding were also stressed in the written instructions for the questionnaire, which, to minimize reactivity, was presented as “*part of a more general investigation into how people of different ages, genders, and cultural backgrounds experience and report emotion.*”

The opening paragraph of the “Julie and Mark” vignette that followed conformed to one of the three versions excerpted below (portions of the text specific to each version are indicated in bold): (1) *Co-residence*: Julie and Mark are co-captains of the Triver College debate team. **They are also childhood friends who had lived under the same roof since the age of 1 and until 18. Raised by their single mothers who shared a townhouse and took shifts caring for them,** Julie and Mark were cleaned and scrubbed in the same bathtub, fought over some of the same toys, ate at the same kitchen table, and were lulled to sleep to some of the same bedtime stories on the same living room couch. They attended all the same schools (beginning with pre-school) and were later part of the same small crowd. (2) *Incest*: Julie and Mark are co-captains of the Triver College debate team. **They are also brother and sister. Raised by a single mother who shared a townhouse with a female friend and her kids (the two women took shifts caring for all the kids),** Julie and Mark were cleaned and scrubbed in the same bathtub, fought over some of the same toys, ate at the same kitchen table,

and were lulled to sleep to some of the same bedtime stories on the same living room couch. They attended all the same schools (beginning with pre-school) and were later part of the same small crowd. (3) *“Regular Sex”*: Julie and Mark are co-captains of the Triver College debate team. **They are also good friends who have known each other since their college freshman year...**

The second paragraph, describing Julie and Mark’s decision to engage in (safe) sex while vacationing in France (see Haidt 2001), was the same in all three versions:On a particular night they are staying alone in a cabin near the beach. They decide that it would be interesting and fun if they tried making love. Julie was already taking birth control pills, but Mark uses a condom too, just to be safe. They both enjoy making love, but they decide not to do it again. They decide to keep that night as a special secret, which makes them feel even closer to each other. (The *“Regular Sex”* vignette also featured a parenthetical explanation that Julie and Mark’s decision not to have sex again was informed by their concern that it may get *“in the way of their work and friendship.”* This addition has been deemed necessary to render Julie and Mark’s decision less suspicious to the readers of this particular version and prevent them from guessing that alternate versions were at play.)

The second page of the questionnaire contained a set of rating scales, including five scales identical to those used in the pilot study, namely the *“disgusted”* probe, the three items comprising the OI index, and the Urge to Lash out item, all as described in the pilot study. The participants were also asked to judge if it was *“morally wrong for Julie and Mark to have sex,”* and, if yes, how wrong it would be (with *“Not at all”* at one end and an act of premeditated murder at the other end of the scale), as well as (largely for exploratory purposes) to rate how averse they would be to *“shaking Julie’s or Mark’s hand in a social situation.”* (all non-categorical ratings were on the 0–10 scale). To test for possible order effects, we partially counterbalanced the

position of the items comprising the OI index as well as that of the *“lash out”* item relative to that index for each of the three vignettes.

The participants were also asked to indicate their age, gender, and *“self-identified cultural background.”* The latter item was included to bolster the cover story. To check on the success of this cover story, participants were asked (once all had completed the questionnaires) to include on the back of the questionnaire a brief description of what they thought to be *“the true purpose of the study.”* All participants were subsequently debriefed.

Results and discussion

The cover story manipulation was largely successful. Most participants wrote that they thought the study was about general effects of culture and gender on emotional reactions to morality and/or sex. The internal consistency estimate for the three OI items was high ($\alpha = 0.91$). Descriptive statistics for OI and all other variables for the entire sample and by vignette type are displayed in Table 1.

Of the participants who read the incest version, 79.3% stated that it was wrong for Julie and Mark to have sex as opposed to 14.3% for the unrelated/co-raised version and 29.6% for the *“regular sex”* version. A logistic regression was conducted to determine whether there were significant differences in dichotomous judgment of whether or not it was wrong for Julie and Mark to have sex based on the vignette that the participants read (the *“regular sex”* version was used as the reference group in this analysis). The model was significant, $\chi^2(2, N = 84) = 28.75, p < .001$, due to incest eliciting more judgments of *“wrong”* than the regular sex version (OR = 9.10, 95% CI = 2.69–30.85; $p < 0.001$). The co-residence version did not differ significantly from the regular sex version (OR = 0.40, 95% CI = 0.10–1.52; $p = 0.18$). Since there were no significant

Table 1 Study 1: Ratings of oral inhibition, moral wrongness and other variables for the entire sample and by vignette type

Variables	Vignette type								F value for vignette main effect	df
	Entire sample		“Regular sex”		Unrelated/co-raised		Incest			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Oral inhibition	1.65	2.46	0.23b	0.57	1.31b	2.09	3.28a	2.93	11.36***	2, 77
Moral wrongness	2.77	3.53	1.62b	2.89	0.93b	2.43	5.52a	3.29	18.77***	2, 76
Disgust	4.18	3.71	1.37c	2.06	3.19b	2.73	7.72a	2.81	34.63***	2, 77
Unwillingness to shake hands with targets	1.71	2.68	0.96b	2.07	1.07b	1.80	3.00a	3.37	5.23**	2, 77
Urge to lash out	0.87	1.92	0.37b	1.01	0.52	1.22	1.66a	2.74	3.71*	2, 77

Note: There were no significant main effects of gender nor any significant gender × vignette type interactions. Letters indicate a significant difference ($p < .05$) between groups according to post hoc Bonferroni tests

* $p < .05$, ** $p < .01$, *** $p < .001$ (two tailed)

order effects for any variable order was not controlled for in any subsequent analysis.

A series of 3 (vignette type) \times 2 (gender) ANOVAs showed that for all continuous variables (oral inhibition, ratings of moral wrongness, disgust, urge to lash out and unwillingness to shake hands), there were significant main effects of vignette type, but not of gender and the vignette \times gender interaction was also not significant. According to post hoc Bonferroni tests, for oral inhibition, moral wrongness and unwillingness to shake hands, ratings were significantly higher for incest than for the other two vignette types. For urge to lash out, ratings for incest differed significantly from regular sex, but not from co-residence. For disgust, in addition to differences between incest and the other two vignette types, ratings for co-residence were also significantly higher than ratings for regular sex. These results are summarized in Table 1.

In the entire sample, OI had a strong significant correlation with judgments of moral wrongness ($r = 0.47$, $p < .001$). The correlation among only those who reported their gender and who received the incest vignette ($n = 29$) showed a non-significant trend in the same direction ($r = 0.25$, $p = .19$). It was also our intent to assess whether the correlation between OI and moral wrongness was direct or if it could be accounted for substantially by anger directed toward the targets in the vignette. However, among those who read the incest vignette, there was a negative correlation between anger and moral wrongness ($r = -0.41$, $p = .028$). In a hierarchical multiple regression, moral wrongness was a stronger predictor of oral inhibition ($\beta = 0.48$, $p = .012$) with anger entered into the model than it was before anger was entered ($\beta = 0.25$, $p = .19$).

We found support for all three aspects of the moral dyspepsia hypothesis in the present study. While the association was not statistically significant, there was a clear trend in which oral inhibition and moral wrongness were related. The lack of significance was, we suspect, due largely to the study's small sample size. With respect to the second requirement, when holding anger ratings constant, the association between oral inhibition and ratings of moral wrongness actually increased. The fact that the association between oral inhibition and moral judgment did not decrease when holding anger constant suggests to us that this association cannot be accounted for by anger. Lastly, the oral inhibition response appeared to be tied specifically to incestuous sex (rather than, say, merely co-residential sex or ad-hoc/"non-committal" sex). This inference follows most directly from the fact that (per the ANOVA results; see above) significantly greater oral inhibition has been reported for the version of the narrative in which the protagonists were described as both related by blood and reared in the same household than for the version in which the protagonists were described as merely reared together

(with the ratings for the latter scenario being statistically equivalent to those reported in response to the version describing the protagonists as college pals who shared neither developmental history nor genes). Furthermore, compared to the other two versions, the incest version also incurred higher ratings of moral wrongness, disgust and unwillingness to shake hands.

Study 2

The findings of Study 1 may be viewed as a provisional confirmation that the oral inhibition reported by the participants was at least in part, a genuine moral sentiment and an immediate outcome of a moral assessment. We consider this confirmation to be provisional because of, among other things, the presence of a viable alternative account for the findings of Study 1, taken from the current incest literature. This alternative account stipulates that when confronted with a tale of an incestuous liaison, individuals respond with an aversion that is due to a kind of pre-moral "empathy". That is, it could be argued that the incest scenario (but not the co-residence scenario) prompts participants to ask the question "What would it be like for me to engage in a similarly incestuous activity *with an opposite sex sibling of my own?*" with the resultant "yak!" response (a presumed product of an evolutionarily adaptive pre-cultural incest avoidance mechanism) being registered as a reaction to the third-party ("Julie and Mark") situation. In contrast, the moral dyspepsia hypothesis posits that the oral inhibition felt by third-party "observers" of sibling sex stems directly from the moral judgment against the act, guided by the cultural (if implicitly formed) understanding that acts of this nature are severely proscribed. Thus, under the moral dyspepsia hypothesis, the reported OI is the direct outcome of a case-specific moral appraisal; under the alternative explanation, OI is a pre-moral response activated by a "natural" aversion (see below) to having or the contemplation of having a sexual encounter with one's sibling (qua a person one co-resided with since early childhood).

To elaborate, recent publications advancing the alternative account (Fessler and Navarrete 2004; Lieberman et al. 2003) suggested that the response in question should be viewed as "empathic," analogous to the vicarious discomfort one would feel at the sight of a child consuming his or her own feces (cf. Fessler and Navarrete 2004). The two reactions would presumably be sub-served by a similar mechanism that allows us to connect emotionally to the states of others.

First, it should be noted that, though the coprophilically inclined child scenario may be illuminating as an analogy, it does break down at one crucial point. In the case of a

child consuming its own feces, substituting ourselves for the protagonist, while keeping the stimulus the same, is sufficient to trigger the recoil. We must simply imagine ourselves in the child's shoes, so to speak, doing whatever it is that the child is doing and the response follows directly. The same is obviously not the case for, say, a male participant imagining himself in Mark's place *making love to Julie*. It is unlikely he will find this scenario very aversive (after all men do mate with other men's sisters). What is presumably required here for the "empathic" aversion to manifest itself is a *personalized re-interpretation* of the story, which will involve re-asking the original question in the context of *one's own opposite sex sibling* relationship while inevitably retaining many an element of this existing relationship (see Royzman et al. [2002] for a review of the inherent difficulty in wishing away the information one has). This being said, there *are* reasons to believe that the mere act of contemplating sex with a sibling of one's own may evoke revulsion (Fessler and Navarrete 2004) and that it may do so prior to and independent of any prior normative commitment against such a practice. Presumably, this may happen via the engagement of the evolutionarily adaptive incest avoidance mechanism (Lieberman et al. 2003). Much of the evidence for the existence of such a mechanism (which would, presumably, be readily accessed once the third-party incest vignette is re-formulated as a personal one) rests on the analysis of marriage patterns and/or romantic attraction within two types of cultural arrangements: the Israeli kibbutzim (where children are reared communally nearly since birth; Shepher 1983) and the sim-pua marriage of Taiwan (the practice in which a future bride, a sim-pua, is adopted by the family of her groom-to-be at an early age; Wolf 1995). In either case, various objective indicators demonstrate the existence of a disinclination or at least indifference to becoming romantically engaged with a co-reared individual even as the moral or social mores of the community *are squarely on the side of such an engagement*.

In short, assuming that all or the majority of the participants in Study 1 had an opposite sex sibling, the personalized re-interpretation account would fit the above-mentioned findings as well as the moral dyspepsia hypothesis by arguing that those reading the incest version (but not the other two versions) of the narrative were likely to indulge in the "what if this were me and my sister"-type counterfactual, registering their resultant *pre-moral* OI as a rating about how they felt about the events depicted in the narrative.

To differentiate these two accounts, our goal in Study 2 (in addition to replicating the basic findings of Study 1) was to identify and contrast two groups of participants, those with and those without the experience of co-residence with an opposite sex sibling. By definition, the personalized re-interpretation/"empathy" account applies

only to the former group. That is, for someone raised as an only child or one of a set of same-sex siblings, the "What would it be like for me to have sex with my opposite-sex sibling?" question must be considered a pure hypothetical and should not engage the putative incest avoidance mechanism in the manner that it would for someone who has co-resided with their opposite-sex sibling. Thus, if the re-interpretation/"empathy" account is largely correct, we should expect to see participants *without* opposite sex siblings showing this substantially weaker response to descriptions of third party incest than their counterparts *with* opposite-sex sibling cohorts. Conversely, should individuals *without* opposite sex siblings report levels of oral inhibition comparable to the levels reported by those *with* opposite-sex siblings, the best explanation (and one fitting readily under the aegis of the moral dyspepsia hypothesis) would have to appeal to some relevant factor that the two groups have in common, in this case the shared social knowledge about the inappropriateness of sibling sex.

Method

Participants

The study included a total of 232 participants (mean age: 20.25, $SD = 5.41$, 63.2% female). The majority of the participants were recruited from two large daytime psychology courses and two smaller evening session psychology courses. Additional questionnaires were distributed to undergraduates at various campus locations.

Materials and procedure

The materials used in the study were identical to those used in Study 1, with three exceptions. First, we did not include the "Regular Sex" version of the vignette. This version was omitted partly because of the low levels of oral inhibition and judgments of moral wrongness it generated in Study 1. Second, to explore the possibility that our focal dependent variable, the OI scale, might have been unduly influenced (inflated) by the presence of the item pertaining to disgust and/or the item pertaining to willingness to shake hands, we excluded both items this time, while including an additional 0–10 item pertaining to fear ("...how *scared* what you just read made you feel?"), which was designed to examine further the role that alternate incest-related affect may play in mediating the relationship between judgments of moral wrongness and OI. Third, additional items were included tapping various facets of participants' sibling history (see Fessler and Navarrete 2004; Lieberman et al. 2003), including the number of opposite sex siblings they have had, the length of time they have resided with each of their opposite sex siblings between (a) their ages of 0 and

18 and (b) their ages of 0 and 10 and their relation to these siblings (i.e., whether the declared sibling was a full-sibling [coded as 0.5], a half-sibling [coded as 0.25], an adopted sibling [coded as 0], or a step-sibling [coded as 0]). These codes were then summed to arrive at each participant's relatedness coefficient for opposite sex siblings. The composition of the probes as well as the codification of the responses was adopted from Lieberman et al. (2003).

Results and discussion

Descriptive statistics for all key variables are given in Table 2. The overall means for both versions were comparable to those reported in Study 1. As in Study 1, based on findings from a logistic regression analysis, participants reading the incest vignette were more likely to judge Julie and Mark's actions as wrong (92.1%) than those who read the co-residence vignette (28.6%), (OR = 29.25, 95% CI = 13.51–63.31; $p < 0.001$). There was a significant main effect of vignette type on oral inhibition score ($\alpha = 0.86$), and on severity of moral judgments with higher scores for the incest vignette in both cases (see Table 2 for other vignette type effects). Findings in Study 2 for associations between oral inhibition and severity of moral judgments were similar to Study 1. The correlation in the entire sample was again significant ($r = 0.54$, $p < .001$) and the correlation among those who received the incest vignette and who reported their gender ($n = 126$) was smaller but statistically significant this time ($r = 0.38$, $p < .001$).

The next issue was whether or not the association between oral inhibition and severity of moral judgment could be mediated by the experience of another emotion (i.e., anger or fear) among those who read the incest vignette. Tests of mediation were conducted using regression analyses according to Baron and Kenny's (1986) approach. Separate analyses were conducted to explore fear and anger as potential mediator variables. The first step in establishing mediation was to show that moral wrongness

predicted oral inhibition, which it did ($\beta = 0.38$, $p < .001$). The second step was to show that moral wrongness predicted the potential mediator variables, which it did (anger: $\beta = 0.36$, $p < .001$; fear: 0.29 , $p = .001$). The third step was to show that the potential mediator variables predicted oral inhibition in models in which moral wrongness was included. Anger met this third requirement in that it significantly predicted oral inhibition, holding moral wrongness constant ($\beta = 0.37$, $p < .001$). In this model, moral wrongness remained a significant predictor of oral inhibition ($\beta = 0.25$, $p = .003$), suggesting that anger partially mediated the association between oral inhibition and moral wrongness. Fear also satisfied the third step to establish mediation in that it significantly predicted oral inhibition, holding moral wrongness constant ($\beta = 0.38$, $p < .001$). In this model, moral wrongness remained a significant predictor of oral inhibition ($\beta = 0.27$, $p = .001$), suggesting that fear partially mediated the association between oral inhibition and moral wrongness.

Our final goal was to test the relevance of the personalized re-interpretation account, which presents, as far as we can judge, the only viable alternative to the moral dyspepsia hypothesis within the published literature. Again, according to the personalized re-interpretation account, when confronted with scenarios of sibling incest, individuals with opposite sex siblings imagine themselves in sex acts with their own siblings, which leads (due to the pre-culturally potentiated incest avoidance mechanism) to disgust (oral inhibition) and subsequently to a moral condemnation of the act. Because the individuals without opposite sex siblings lack the requisite life experiences out of which to construct this imaginary interaction, their OI response should be a relatively weak one. In actuality, a series of t-tests found no significant difference in either OI or moral wrongness ratings for those with and those without opposite sex siblings (for either vignette). More specifically, the moral wrongness ratings made by those without opposite sex siblings ($M = 6.62$, $SD = 3.08$) for

Table 2 Study 2: ratings of oral inhibition, moral wrongness and other variables for the entire sample and by vignette type

Variables	Vignette type						F value for vignette main effect	df
	Entire sample		Unrelated/co-raised		Incest			
	Mean	SD	Mean	SD	Mean	SD		
Oral inhibition	2.91	2.74	1.20	1.47	3.95	2.81	51.53***	1, 181
Moral wrongness	4.90	4.02	1.44	2.74	7.02	3.11	136.80***	1, 180
Scared	1.67	2.55	0.60	1.29	2.32	2.89	19.17***	1, 181
Urge to lash out	0.97	1.92	0.27	0.83	1.39	2.24	12.33**	1, 181

Note: There was a significant main effect of gender for oral inhibition and scared. There were no significant gender \times vignette interactions

* $p < .05$, ** $p < .01$, *** $p < .001$ (two tailed)

the incest scenario were as high as the corresponding ratings made by those with opposite sex siblings ($M = 7.21$, $SD = 3.13$), $p = 0.31$. Likewise, the OI ratings for the incest scenario were roughly the same irrespective of the participants' reported sibling status ($M = 4.08$, $SD = 2.96$ and $M = 3.4$, $SD = 2.6$ for those with and without opposite-sex siblings, respectively, $p = 0.21$).

To further test the personalized re-interpretation account we examined correlations between OI and several sibling status variables (i.e., relatedness coefficient, number of opposite sex siblings, number of years exposed to opposite sex siblings between the ages of 0–10 and 0–18) in each of the two vignettes presented as part Study 2. No significant correlations were found between OI and any of the sibling status variables for either of the two vignettes (r 's ranged from 0.04 to 0.18). This, in conjunction with the previously mentioned finding of no significant difference in either OI or moral wrongness ratings for those with and without opposite sex siblings (for either incestuous or co-residential sex), further calls into question the personalized re-interpretation account as a viable alternative to the moral dyspepsia hypothesis.

General discussion

We reported on a series of exploratory studies probing the thesis that a consideration of certain acts as immoral may in and of itself trigger genuine gastrointestinal discomfort, not unlike that brought on by the consumption of foul-tasting foods or exposure to fetid odors. More specifically, in Study 1 we found that significant oral inhibition was reported for the vignette describing consensual sex between a brother and a sister, but not for the otherwise identical vignette describing sex between two unrelated individuals reared together. In Study 2 we replicated this aspect of Study 1 and found the results to be independent of the extent to which participants grew up with opposite sex siblings. This finding is consistent with the idea that the experience of OI in this case is less a function of a specific sibling history (early co-residence) than it is of the culturally acquired moral knowledge about proscribed forms of sexual behavior. Both studies have been consistent in suggesting that the association between oral inhibition and moral judgment is direct in the sense that it is not due entirely to the concomitant effect of anger or fear. We found that the relationship between moral wrongness and OI either was enhanced when controlling for anger (Study 1) or remained significant when controlling for anger or fear (Study 2). Finally, it should be noted that, while the incest-associated OI ratings reported above may appear somewhat low in absolute terms ($M = 3.28$ in Study 1 and $M = 3.95$ in Study 2), this was not unexpected given the

extreme nature of the physical events (motion sickness, gulping a “really” foul-tasting drink) used as anchors for the positive endpoints of the constituent scales (see above for complete descriptors).

Limitations

Although the studies reported here provide evidence for the direct link between a particular type of negative moral assessment and a reaction of gustatory discomfort, they are subject to at least two major limitations. One is that all of our findings depend on the use of a single hypothetical vignette. In doing so we followed the suit of our predecessors (Fessler and Navarrete, 2004; Haidt 2001; Lieberman et al. 2003) and, as discussed earlier, the one vignette we use is a well-known part of the literature and was ideally suited to our purposes, allowing us to isolate the offense of incest as such from other accompanying offences, e.g., lying/assuming false identities (Fessler and Navarrete 2004) or from the negative consequences that would be expected in the wake of such an act. Still, it would be interesting in the future to consider and compare participants' responses to a set of stimuli that vary the details of the story (casual sibling sex vs. sibling sex in the context of long-standing romantic love; the protagonists as siblings vs. first cousins) as well as its format (text vs. visual).

The second possible limitation concerns our main dependent measure, the OI index. Muth et al. (1996) suggested that even as seemingly specific a descriptor as “nausea” may refer to a somewhat different array of somatic sensations in different situations. Thus, notwithstanding OI's high internal consistency across the studies and the fact that it tapped the specifically GI-related responses of gagging and the like, our measure might have failed to reflect all the richness of the participants' somatic distress the way this could have been accomplished via a more nuanced instrument, such as Muth et al.'s (1996) 17-item Nausea Profile. Its future use would be advisable, along with OI and the pertinent physiological measure (i.e., electrogastrography, see Muth et al. 1998), assuming a stimulus of appropriate duration and strength. This more multifaceted means of OI assessment and induction may go a long way in strengthening the reported relationship between OI and moral judgment as well as augmenting the intensity of the OI reaction itself.

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