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Does injustice affect your sense of taste and smell? The mediating role of moral disgust

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HIGHLIGHTS

- Violations of interpersonal justice trigger a heightened sense of taste and smell.
- Disgust mediates the relationship between injustice and sensory perception.
- These effects occur over and above feelings of anger.

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ABSTRACT

Unfair treatment can activate strong negative emotions among victims and third parties. Less is known about other innate and evolutionary-based reactions to unfairness, such as those that manifest themselves through our senses. In three experiments, we found that interpersonally unfair treatment at work, defined as treatment that violates an individual's sense of dignity and respect, triggered disgust emotions over and above anger which subsequently related to stronger taste and smell reactions to gustatory and olfactory stimuli. This effect was observed for pleasant and unpleasant tasting products, for agreeable and malodorous scents, and among both mistreatment victims and third parties. Our findings suggest that violations of dignity and respect can trigger an evolutionary based reaction that activates a human alarm system, warning individuals of impending threats even when no oral threat is imminent.

Does interpersonal injustice affect your taste and smell perceptions?

The mediating role of moral disgust

Considerable research has emphasized the role of conscious reasoning as a determinant of people's reactions to (un)fairness (e.g., equity theory, Adams, 1965). Evidence also shows, however, that unfair treatment can also produce involuntary justice reactions that arise with little conscious deliberation (e.g., Miller, 1997; Skarlicki & Rupp, 2010; Usoof-Thowfeek, Janoff-Bulman, & Tavernini, 2011). Folger (2001) theorized that these reactions involve evolutionary-based emotions such as anger and disgust that occur not only among victims of mistreatment, but also among third parties who are not directly affected by the mistreatment (see also Henrich, 2006; Henrich et al., 2006).

Several studies have examined emotional responses to workplace unfairness (e.g., Barclay, Skarlicki, & Pugh, 2005; Bies, 1987; De Cremer, 2007; see Cropanzano, Stein, & Nadisic, 2010 for a review), but the emotion of *disgust* is relatively under-researched. This oversight is important given evidence that people report experiencing disgust in response to workplace injustice (Tripp & Bies, 2010). Most researchers who study disgust, however, have argued that unfair treatment should trigger anger, but not disgust because the latter emotion is triggered only by violations of physical, moral, or spiritual purity (Horberg, Oveis, Keltner, & Cohen, 2009; Rozin, Lowery, Imada, & Haidt, 1999). Although empirical research has generally supported this claim (Haidt & Hersh, 2001; Rozin et al., 1999; Vasquez, Keltner, Ebenbach, & Banaszynski, 2001), the findings are equivocal because some studies also show that unfairness can indeed trigger disgust (e.g., Cannon, Schnall, & White, 2011; Chapman, Kim, Susskind, & Anderson, 2009).

In the present paper we explore whether fairness violations can indeed trigger disgust. By doing so we contribute to the emerging literature on non-conscious responses to unfairness. Specifically, we examine whether being the direct recipient of unfair treatment or simply seeing others being treated unfairly, triggers disgust over and above anger. We then investigate whether experiencing disgust is associated with a heightened sensitivity to taste and smell. We test these involuntary reactions in the context of workplace violations of what organizational researchers refer to as *interpersonal justice*.

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Interpersonal justice is defined as the extent to which a person is treated by another person in a social interaction in ways that show a lack of politeness, dignity and respect independent of the outcomes allocated and the decision procedures followed in the interaction (Greenberg, 1993). Examples of interpersonal injustice include a supervisor publicly berating an employee or directing an ethnic slur towards him or her.

Drawing upon literature on evolutionary-based responses to one's environment, we propose that being exposed to interpersonal injustice elicits feelings of *socio-moral disgust*, which is disgust elicited by appraisals of contamination, impurity, or potential degradation (Marzillier & Davey, 2004; Rozin, Haidt, & McCauley, 1993). Horberg et al. (2009) expanded this definition to suggest that socio-moral disgust is a "revulsion evoked by people who commit vulgar violations against others" (p. 964). We propose that socio-moral disgust activates a human alarm system that warns the body of potential danger. A consequence of this activation is that experiencing or witnessing injustice can produce involuntary physiological consequences. We hypothesize that one of these physiological consequences is heightened taste and olfactory sensitivity. We focused on taste and smell because these two sensory modalities are closely tied to disgust emotions (Rozin, 1982).

In Study 1 we explored the effects of interpersonal justice violations on disgust reactions and taste among direct victims of mistreatment. In Study 2 we tested whether these effects also occur among third party observers of mistreatment. In Study 3 we explored whether the effects from Study 2 extend to the sense of smell. Across all studies, we expected that interpersonal justice violations amplify taste and smell perceptions, and that these effects are mediated by disgust.

Background

Morality researchers have identified five foundations underlying humans' moral concerns: harm/care, fairness/reciprocity, in-group loyalty, authority/respect, and purity/sanctity (e.g. Graham, Haidt, & Nosek, 2009; Haidt & Graham, 2007; Haidt & Joseph, 2007). According to the appraisal-tendency framework (Lerner & Keltner, 2000, 2001) each domain is associated with a distinct set of emotional and motivational reactions that arise innately, meaning they are organized in advance of the experience. These reactions have been described in terms of evolutionary preparedness (Seligman, 1971). In the present research we focused on the fairness/reciprocity and purity domains because we believe the two are more closely associated with one another than previous research suggests, at least in the case of interpersonal justice violations. Other researchers (e.g., Cannon et al., 2011) have made a similar claim.

Fairness and purity as foundations of morality

The fairness/reciprocity domain concerns beliefs that people should respect each other's individual rights, reciprocate benefits received, and treat others fairly. Actions are "judged morally wrong if they are unfair or partial, create inequality, or otherwise restrict others' rights" (Horberg et al., 2009, p. 964). The primary moral emotion that arises from justice violations is anger. The purity domain, in contrast, involves values and principles that protect the sanctity of the body and soul. Purity violations are theorized to be associated with disgust. Although these values originally related to oral disgust in reactions to toxins or parasites (physical forms of impurity), they have been extended to include concerns over another individual's character and social conduct, giving rise to socio-moral disgust.

The link between unfairness and disgust warrants further investigation for several reasons. First, as noted above, the research is not entirely consistent regarding whether unfairness triggers disgust. Second, not all fairness violations are the same — indeed unfair treatment can lead to anger, but some aspects of injustice might also arouse disgust. To date, disgust researchers have studied more general forms of fairness (e.g., failing to reciprocate favors, interrupting a meeting; leaving overly small tips) and found no effects on disgust emotions. Horberg et al. (2009), for instance, found in three studies that disgust (but not anger) amplifies the moral significance of the moral domain of purity (but not the moral domain of fairness). They observed the specific effects of impurity and purity on disgust as it arose from the reading of vignettes (Study 1) from its artificial inducement (Study 2) or from its usual experience (measurement of trait disgust in Study 3). Notice, however, that Horberg et al.'s (2009) justice violations (i.e., a student doesn't return a class textbook thus preventing another student from using it and a colleague interrupting another colleague during work meetings) might not have been construed as serious moral violations of civilized behavior. As a result, their fairness manipulation might not have been sufficiently strong to produce socio-moral disgust.

The nature of the fairness violation is germane to our theoretical argument because organizational justice researchers have identified four aspects of workplace fairness: distributive justice (the fairness of one's outcomes), procedural justice (the fairness of the procedures used to derive one's outcomes), information justice (the degree to which individuals receive an adequate explanation for decisions), and interpersonal justice (see definition above) (Colquitt, 2001). Although all four types of fairness could, in principle, elicit a moral response such as disgust, violations of interpersonal justice are arguably most likely to do so because they more clearly indicate that a person does not recognize that the other party deserves to be treated with dignity and respect. In other words, the transgressor "places him or herself above them as if superior to moral authority" (Folger, Cropanzano, & Goldman, 2005, p. 217). Moreover, evidence shows that the vast majority of injustices that people report in their daily lives concern interpersonal rather than distributive or procedural issues (Mikula, Petri, & Tanzer, 1990). One might conclude that a major reason for this discrepancy is that people are more sensitized to how others treat them in social interactions because, from an evolutionary perspective, such cues are important for identifying immediate threats in their local environment (e.g., Is this person a friend or foe?). If people devote a large share of their attentional resources to processing information about interpersonal treatment, then their reactions to such treatment are likely to become more reflexive or automatic over time.

Third, other aspects of workplace injustice, such as one's pay or a company's decision making procedures can create ambiguity regarding whether mistreatment has occurred and therefore require more elaborate cognitive processing (see equity theory, Adams, 1965) to determine whether unfair treatment was intentional (see a discussion of accountability cognitions in justice perceptions; Folger & Cropanzano, 1998). In contrast, interpersonal justice violations perceptions should occur more automatically and require less deliberation because they provide a relatively unambiguous signal of a moral violation from an identifiable human source (Folger & Skarlicki, 2008).

Empirical research supports our assumption that reactions to interpersonal justice violations at work have a moral basis (e.g., Skarlicki & Rupp, 2010). Reb, Goldman, Kray, and Cropanzano (2006), for instance, found that when people experienced an interpersonal justice violation, they preferred a remedy that included moral vindication of the victim, such as harsh punishment. When a distributive injustice was experienced, in contrast, then participants felt that monetary compensation was sufficient. This finding provides some support for our claim that interpersonal justice violations are the kind that are most likely to trigger disgust.

The link between moral disgust and sensory perception

The emotion of disgust has its roots in the sense of taste. Disgust comes from joining "dis" and the Latin word "gusto," meaning taste. The fact that people might experience *distaste* toward perpetrators of moral violations and feel *disgusted* by their behavior is not merely a metaphorical expression. Chapman et al. (2009) measured the activation of the levator labii muscle region of the face that is thought to demonstrate disgust expressions. They found that the same facial motor

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activity and the same subjective judgments were evoked by oral disgust (elicited by the drinking of unpleasant liquids), basic disgust (elicited by photographs of contaminants), and moral disgust (elicited by unfair treatment in an economic game). Their results, however, have been questioned for being unclear about whether their participants experienced "true" disgust (or rather contempt/anger) after being treated unfairly (Rozin, Haidt, & Fincher, 2009). Cannon et al. (2011) also measured specific muscle activity in response to a range of moral foundations, including purity and fairness violations. They found that muscle activity related to disgust was most strongly connected to purity violations, but also to fairness violations, including acts of cheating, stealing, and discriminating against others.

Research from evolutionary psychology supports an association between the experiences of disgust and sensory perceptions. This connection is important because humans have a psychological and physiological system that helps them detect and handle alarming situations, that when activated, triggers individuals to process what is happening in their environment in an efficient way so that threats to survival can be managed quickly (Eisenberger & Lieberman, 2004). Disgust activates this human alarm system and aids individuals in making quick sense of incoming stimuli (Rozin, Imada, Haidt, & Mccauley, 1997). As described above, disgust functions as a sensory mechanism to reduce exposure to oral and olfactory threats. If so, then it is conceivable that when the alarm system is triggered by exposure to something disgusting, the sensitivity of various modalities that people use to detect oral threats could be amplified. As noted earlier, the two sensory modalities most closely linked to disgust are taste and smell (Rozin, 1982). The ability to perceive one's environment more accurately provides a protective function for the individual, a role that the facial expression of disgust is also thought to play (Susskind et al., 2008). We theorized that perceptual sensitivity in the domain of sensory experience can be amplified by mere exposure to interpersonal injustice because the disgust that these injustices provokes can alert the alarm system that functions as if the injustice was a potential threat to the organism's survival.

The link between disgust and taste has been shown in previous empirical research. Ritter and Preston (2011) found that participants rated beverages as tasting more disgusting after they copied religious texts belonging to out-groups but not in-groups. Their research, however, proposed that out-groups can give rise to moral impurity, leading to disgust reactions. We extend their argument by hypothesizing that disgust emotions and subsequent taste sensitivity can arise from violations of fairness.

We expected that this process occurs not only for taste but also for the sense of smell. We often smell food before we taste it because the odor molecules float into our nasal cavity as we take food into our mouths. Most of what is generally considered as taste is actually determined by our olfactory receptors (Beidler, 1971). Consequently, the same biological alarm system activated by interpersonal injustice which increases our sensitivity to taste should have a similar effect on smell.

We contend that while this alarm activation process should lead to greater taste and smell sensitivity, which in our studies was indicated by the perceived strength of the sensory experience, it should not affect the pleasure-related aspects (e.g., liking or enjoying) of the experience to the same degree. Our reasoning is based on the assumption that the human alarm system operates to protect the individual in emergency situations. The feeling of moral disgust should heighten the perceived intensity of the taste or odor of a stimulus, so that if the stimulus were to possess dangerous qualities, it could be detected, avoided, or expectorated. This process is not directly relevant to the subjective judgment of the pleasure gained from a sensory experience. Hence, we would not expect that unfair interpersonal treatment would trigger individuals' sense of enjoyment of the stimuli.

Based on the theoretical arguments linking (a) perceived interpersonal injustice to moral disgust, and (b) moral disgust to the activation of an alarm system that warns of potential danger, we tested the following hypotheses:

Hypothesis 1a. Interpersonal injustice causes food and drink to taste stronger, but has no effects on food and drink enjoyment.

Hypothesis 1b. Interpersonal injustice causes odors to smell stronger, but has no effects on odor enjoyment.

Hypothesis 2. The effect of interpersonal injustice on sensory perception is mediated by disgust.

We tested these hypotheses in three studies. In Study 1, we tested the effects of interpersonal injustice on taste among victims of interpersonal injustice. In Study 2, we tested whether these effects generalize to third parties. In Study 3 we tested whether the effects found in Study 2 extend to the sense of smell.

Study 1

Methods

Participants

Study 1 participants consisted of 76 undergraduate students attending courses in a large North American university (63.2% female, mean age 21.8 years, $SD = 3.06$). All participants were either currently employed or had previous work experience.

Procedure

Participants were ostensibly invited to take part in two research studies: a workplace fairness study and a marketing taste test. Upon arriving in the laboratory, they were told that half of the participants would be administered the taste test first, while the other half would be administered the workplace fairness study first. In reality, all participants were administered the workplace fairness study first and the taste test second.

This cover story was used for at least two reasons. First, it is not unusual for laboratory participants to take part in two studies in one sitting. Second, the first and second authors are organizational behavior and marketing researchers, respectively, and this information was provided on the behavioral ethics forms, making the likelihood of participants taking part in two studies quite reasonable. In the study debrief, none of the participants reported suspecting a connection between the two studies.

The study consisted of a between-subjects design with participants randomly assigned to a fair or unfair condition. Participants were given the following instructions: "In the space below please write a short story about an actual situation that you experienced in which you were treated fairly (unfairly) by a leader in the workplace. By fair (unfair) we mean that you were treated with a high degree (lack) of dignity and respect." Once the writing task was finished, participants completed the relevant measures. The participants were then told that the first study was finished and that the taste study was beginning. They were given a small sample of a mildly unpleasant yeast-based product that was unfamiliar to most participants (Marmite). Prior research has utilized Marmite-flavored products to examine effects of various stimuli on sensory sensitivity (Woods et al., 2011). Last, we administered the taste measures.

Measures

Manipulation check

We assessed whether the fairness manipulation was effective using three items: "In my story" (stem): "I was treated fairly"; "I was treated with dignity"; "I was treated with respect." Responses ranged from strongly disagree (1) to strongly agree (5). The items were averaged to form the manipulation check (Alpha = .90).

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Moral disgust

Following research on disgust measurement by Nabi (2002) we assessed moral disgust using three items: "As a result of this experience, I was: "grossed out"; "disgusted", and "repulsed." The response scales ranged from not at all (1) to extremely (5). The items were averaged to form the disgust measure (Alpha = .89).

Taste strength

To measure taste strength, we adapted two items from prior taste research (Allison & Uhl, 1964): "This product has a strong flavor"; "This product has a strong after-taste". The response scales ranged from strongly disagree (1) to strongly agree (7). The two items were averaged to form the measure (Alpha = .70).

Taste enjoyment

We included two questions to measure the extent to which the participants enjoyed the product: "How much did you like the taste of this product?" and "How much did you enjoy the taste of this product?" Responses ranged from not at all (1) to very much (9). The items were averaged to form the measure (Alpha = .84).

Control variables

We also measured a previously studied emotion that was also expected to arise from injustice, namely, anger. Participants rated the degree to which they were feeling "angry," and "upset". Responses ranged from not at all (1) to extremely (5). The items were averaged to form the measure (Alpha = .91).

Results

Participants in the unfair interpersonal justice treatment condition rated the manipulation check significantly lower ($M = 2.15$, $SD = .87$) than participants in the fair treatment condition ($M = 4.32$, $SD = 1.05$), $F(1, 74) = 89.55$, $p < .001$ ($\eta^2 = .27$). The correlations, means, and standard deviations are given in Table 1. Participants in the unfair condition rated the taste stronger ($M = 5.55$, $SD = 1.18$) than participants in the fair condition ($M = 4.84$, $SD = 1.40$), $F(1, 74) = 5.64$, $p = .02$, $\eta^2 = .07$ As theorized, the results showed no significant differences between participants' ratings of taste enjoyment between unfair ($M = 2.21$, $SD = 1.50$) and fair ($M = 2.65$, $SD = 1.68$) conditions, $F(1, 74) = 1.44$, $p = .23$, $\eta^2 = .01$. We ran the analysis with and without controlling for anger and the pattern of results did not change. Thus Hypothesis 1a was supported.

To test for the mediating effects of disgust over and above alternative mediation effects of anger, we utilized the PROCESS Multiple Mediation Model 4 (Hayes, 2012). Specifically, a bootstrapping procedure with 5000 bootstrap samples was conducted with treatment as the independent variable, disgust and anger as mediating variables, and taste strength as the dependent variable. The results showed that the 95% confidence intervals for disgust did not include zero (95% CI [.03, .55]), indicating an indirect effect of fairness on taste strength perceptions through disgust. In contrast, the confidence interval for anger did include zero (95% CI [-.19, .10]), indicating that anger did not mediate the effect of fairness on taste strength. Fig. 1 provides the regression results of the mediation model. These results support Hypothesis 2.

Table 1
Means, standard deviations, and correlations (Study 1).

	Mean	*SD*	1	2	3	4	
1. Treatment	.50	.50					
2. Taste strength	5.17	1.33	.26*	(.70)			
3. Disgust	1.84	1.10	.49**	.27*	(.89)		
4. Taste enjoyment	2.43	1.60	−.13	.21	.06	(.84)	
5. Anger	3.89	2.16	.37**	.28*	.43**	.07	(.91)

Note; N = 76; Treatment is coded fair (0) unfair (1) interpersonal justice; reliabilities are given in parentheses along the diagonal; $p < .05$; $^{**}p < .01$.

Discussion

The results support our hypothesis that being the target of unfair interpersonal injustice can trigger involuntary effects on sensory perceptions. Participants who wrote about an experience in which they had been treated with a lack of dignity and respect at work also reported that the product tasted stronger than did participants in the fair treatment condition. Moreover, in support of our theoretical arguments about the link between disgust and physiological responses, disgust accounted for these effects.

As noted above, Folger (2001) proposed that third parties can also experience evolutionary-based reactions to treatment that violates moral and social norms. He argued that individuals can react to perceived injustice out of a sense of duty, obligation, and moral virtue. These reactions are regulated by *a priori* ethical principles of an innate nature (Kant, 1999; Wood, 1999). Individuals can therefore experience moral unrest by seeing others mistreated, which in turn will trigger feelings of moral indignation consisting of discrete but related negative emotions such as anger and disgust (Folger, 1993; Folger et al., 2005). In Study 2, we tested this possibility.

Study 2

Study 2 extended Study 1 in two ways. First, in Study 1 we utilized a relatively unpleasant product as the taste stimulus. A more conservative test would be to determine whether this effect generalizes to a more pleasant tasting product. Prior research has found significant effects of bitter taste on subsequent moral disgust judgments, but no effect of sweet taste on such judgments (Eskine, Kacinik, & Prinz, 2011). Thus, to test for the effects of interpersonal injustice on taste, in addition to testing third parties' taste of a relatively unpleasant product, we added a condition in which participants tasted a more pleasant, sweet tasting product. We expected that unfairness increases test strength independent of the taste of a particular product (i.e., a main effect of unfairness in both product conditions). Second, whereas in Study 1 participants were assigned to a fair versus unfair condition, in Study 2 participants were assigned to an unfair versus control (neutral) condition. This design provided a stronger test of our hypotheses and enabled us to ensure that the direction of our effect was an increase in taste strength in response to interpersonal unfairness rather than a muting of taste strength in response to interpersonal fairness.

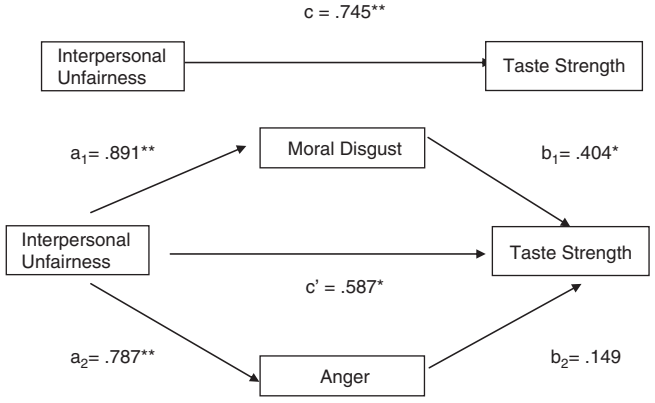

Fig. 1. Disgust and anger as mediators of the effect of Interpersonal Unfairness on Taste Strength (Study 1) (PROCESS Multiple Mediation Model 4; Hayes, 2012). Asterisks indicate significant regression paths ($^{**}p < .01$, $^{*}p < .05$).

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Methods

The participants consisted of 137 undergraduate students attending a large North American university (66% female, mean age 22.92, SD = 5.00). The procedures for Study 2 were similar to those described in Study 1. Participants were randomly assigned to a 2 (treatment: unfair versus control condition) × 2 (product: unpleasant versus pleasant condition) factorial design. The unpleasant product was Marmite. The pleasant product was strawberry flavored Sunny D, a commercially available juice that pre-testing was found to be relatively unfamiliar and more pleasant than marmite to our participants.

Participants first viewed on a computer terminal a 3.6-minute video segment in which a manager wrongly and purposefully accuses an employee of theft (unfair condition) or is seen interacting socially with employees at work (control condition). Participants then rated their level of disgust with the manager's behavior in the video, and completed the study's measures. Third, they were administered the taste test ostensibly as a marketing study.

Measures

Manipulation check

The fairness manipulation was assessed using three summed items: "The manager in the video treated the employee unfairly" (reverse coded), "The manager treated the employee with dignity"; "The manager treated the employee with respect" (Alpha = .83). Measures of *moral disgust* (Alpha = .78), *taste strength* (Alpha = .81), *taste enjoyment* (Alpha = .83), and *anger* (Alpha = .75) were the same as those in Study 1.

Results and discussion

The correlations, means, and standard deviations are given in Table 2. Participants in the interpersonal injustice treatment condition rated the manipulation check significantly lower (M = 6.57, SD = 2.02) than did participants in the control condition (M = 7.89, SD = 1.83), $F(1, 134) = 15.73$, $p = .001$ ($\eta^2 = .24$). Participants in the unfair condition reported that the product tasted stronger (M = 5.79, SD = 1.33) relative to participants in the control condition (M = 5.14, SD = 1.34), $F(1, 134) = 5.38$, $p = .02$ ($\eta^2 = .04$). There was an expected main effect of product (marmite was rated stronger than Sunny D) on taste strength, $F(1, 134) = 6.67$, $p = .01$ ($\eta^2 = .05$) and taste enjoyment, $F(1, 134) = 50.24$, $p = .000$ ($\eta^2 = .27$). The interaction term between treatment and product predicting taste strength, however, was not significant, $F = 2.48$. $p = .11$, $\eta^2 = .01$, indicating that there were no significant differences in the hypothesized results for participants who tasted the unpleasant versus the pleasant product. In an analysis of the cell means in Table 3, the simple effects of treatment (fair, control) on disgust were significant in both the marmite $t(67) = 2.97$, $p = .004$, $d = .92$, and the Sunny D conditions, $t(66) = 2.81$, $p = .006$, $d = .90$. The simple effects of treatment on taste strength were also significant in the marmite $t(67) = 2.21$, $p = .03$, $d = .70$, and Sunny D conditions $t(66) = 1.69$, $p = .04$ (one-tailed), $d = .69$. No significant differences on taste enjoyment were observed between the unfair (M = 3.09, SD = 1.70) and fair (M = 3.31, SD = 1.65) conditions $F(1, 134) = .14$, $p = .70$, $\eta^2 = .00$).

We used the mediation tests described in Study 1 (Hayes, 2012). Specifically, 5000 bootstrap samples were conducted with fairness as the independent variable, disgust and anger as mediating variables, taste strength as the dependent variable, and product type as a control variable. The 95% confidence interval for disgust did not include zero (95% CI [.02, .39]), indicating an indirect effect of treatment on taste strength perceptions through disgust. The confidence interval for anger, in contrast, did include zero (95% CI [−.15, .04]), indicating that anger did not mediate the effect of fairness on taste strength. Mediation results are given in Fig. 2. Thus, Hypotheses 1a and 2 were supported.

Study 2 replicated the Study 1 results for people who were exposed to interpersonal injustice directed against someone else. Notably, the effects occurred for participants in both pleasant and unpleasant product conditions, suggesting that the effects of injustice on both emotional and physiological reactions are robust. Moreover, the effect of injustice on taste perceptions was mediated by moral disgust over and above the effects of anger indicating that both responses can occur in the aftermath of exposure to injustice.

Table 2
Means, standard deviations, and correlations (Study 2).

	Mean	*SD*	1	2	3	4	5	
1. Treatment	.49	.50						
2. Product	.50	.49	−.07					
3. Taste strength	5.54	1.34	.18*	.21*	(.81)			
4. Disgust	2.65	1.29	.29**	.12	.17*	(.78)		
5. Taste enjoyment	3.20	1.64	−.03	.52**	.11	−.14	(.83)	
6. Anger	3.54	1.10	.34**	−.04	.17*	.39**	.06	(.75)

Note: N = 136; Treatment condition is coded control (0), unfair (1) interpersonal justice; Product is coded bitter (0), sweet (1); Cronbach's Alphas are given in parentheses along the diagonal. ** $p < .01$; * $p < .05$.

Study 3

In Study 3, we sought to constructively replicate the findings of Study 2 on smell, a sensory modality on which our ability to taste is highly dependent (Rozin, 1982). Following the procedure used in Study 2, we tested the effect of interpersonal injustice on perceptions of both an unpleasant and a pleasant scent.

Methods

Participants consisted of 128 undergraduate business students attending a large North American university (63% female, mean age 21.34, SD = 2.64). Participants were randomly assigned to a 2 (interpersonal injustice treatment: unfair versus fair) × 2 (scent: unpleasant vs. pleasant) factorial design. The unpleasant scent was *Buckley's Cough Syrup*. The pleasant scent was a melon-scented aromatherapy oil. A pre-test confirmed that the pleasant scent was perceived to be moderately pleasant and the unpleasant scent was perceived to be moderately unpleasant.[3]

Participants first viewed a 3.6-minute video on a computer terminal, consisting of a video in which a university instructor informed a class of students about a change in his schedule that would affect the students' schedule. One female student questioned the change. In the unfair condition, the instructor talked to her in an abrupt and rude manner. In the fair condition, the instructor responded in a polite and courteous manner. After watching the video, the participants rated their level of disgust with the instructor's behavior, and completed the manipulation check and anger measure. They were then administered the smell test ostensibly as a marketing study.

Measures

Manipulation check

The fairness manipulation was tested using three items: "The instructor in the video treated the female student unfairly" (reverse coded), "The instructor treated the female student with dignity"; "The instructor treated the female student with respect." The items were averaged to form the manipulation check (Alpha = .72).

[3] Details of the pretest are available from the first author.

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Table 3
Taste strength, enjoyment, and disgust results by condition (Study 2).

	Unfair treatment			Control		
	Marmite n = 35	Juice n = 34	Average n = 69	Marmite n = 33	Juice n = 35	Average n = 68
Taste strength	5.88 (1.35)	5.71 (1.29)	5.79 (1.33)	5.11 (1.29)	5.17 (1.35)	5.04 (1.34)
Taste enjoyment	2.11 (1.68)	4.07 (1.73)	3.09 (1.70)	2.40 (1.64)	4.23 (1.66)	3.31 (1.65)
Disgust	2.94 (1.32)	3.09 (1.49)	3.01 (1.41)	2.02 (1.23)	2.19 (1.14)	2.11 (1.18)
Anger	3.16 (.99)	3.22 (1.18)	3.19 (1.09)	3.81 (1.01)	3.90 (1.21)	3.88 (1.10)

Moral disgust and anger

Disgust and anger were assessed using the measures from Study 1 (Alpha = .85 and .80, respectively).

Odor strength

Odor strength was assessed using one item: "How strong is the smell of the product?" on a 9-point scale from not at all (1) to very (9). Seven responses were identified as outliers (falling outside two standard deviations from the mean) and were removed.

Odor enjoyment

Enjoyment of the stimulus was measured with two items: "How much do you like the smell of this product?" and "How much did you enjoy the smell of the product?" Responses ranged from not at all (1) to very much (9). The items were averaged to form a product liking measure (Alpha = .95).

Results and discussion

Table 4 provides the means, standard deviations and correlations. Participants in the unfair interpersonal treatment condition rated the manipulation check significantly lower ($M = 1.45$, $SD = .48$) than did the participants in the fair condition ($M = 2.41$, $SD = .84$), $F(1, 124) = 63.50$, $p < .001$ ($\eta^2 = .34$). As predicted, participants rated odor strength higher in the unfair ($M = 6.69$, $SD = 1.39$) versus the fair condition ($M = 6.03$, $SD = 1.93$), $F(1, 117) = 5.42$, $p = .02$ ($\eta^2 = .04$). There was also an expected main effect of scent type on odor strength (unpleasant scent was rated stronger than pleasant scent), $F(1, 117) = 42.70$, $p < .001$ ($\eta^2 = .27$). The interaction of treatment and scent type on perceived odor strength, however, was not significant $F(1, 117) = .00$, $p = .98$, ($\eta^2 = 0$). The effect of treatment on participants' odor enjoyment was not significant ($M_{unfair} = 5.10$, $SD = 2.44$ vs. $M_{fair} = 4.68$, $SD = 2.39$), $F(1, 124) = 1.39$, $p = .24$ ($\eta^2 = .01$). An expected main effect of scent type on odor enjoyment was observed (the pleasant scent was rated higher than the unpleasant scent) ($F(1, 124) = 34.69$, $p < .001$ ($\eta^2 = .22$), but the interaction term of treatment and scent predicting enjoyment was not significant, $F(1, 124) = 1.82$, $p = .18$ ($\eta^2 = .01$). In an analysis of the cell means in Table 5, the simple effects of treatment on disgust were significant in both the pleasant scent condition $t(61) = -2.44$, $p = .01$ (one tailed) $d = .61$, and the unpleasant scent conditions, $t(63) = -1.66$, $p = .05$ (one tailed) $d = .41$. The simple effects of treatment on odor strength were marginally significant in the pleasant scent condition $t(57) = -1.58$, $p = .06$ (one tailed) $d = .42$, and significant in the unpleasant scent condition $t(60) = -1.72$, $p = .04$ (one tailed) $d = .44$.

As above, we tested for mediation effects using Hayes (2012) multiple mediator model. We generated 5000 bootstrap samples, with fairness as the independent variable, disgust and anger as mediating variables, odor strength as the dependent variable, and scent type as the control variable. A 95% confidence interval for disgust did not include zero (95% CI [.01; .42]), indicating an indirect effect of fairness on odor strength perceptions through disgust. In contrast, the confidence interval for anger included zero (95% CI [−.26; .24]), indicating that anger did not mediate the effect of fairness on odor strength. Fig. 3 provides the regression coefficients for the mediation model (Hayes, 2012). These results support Hypotheses 1b and 2.

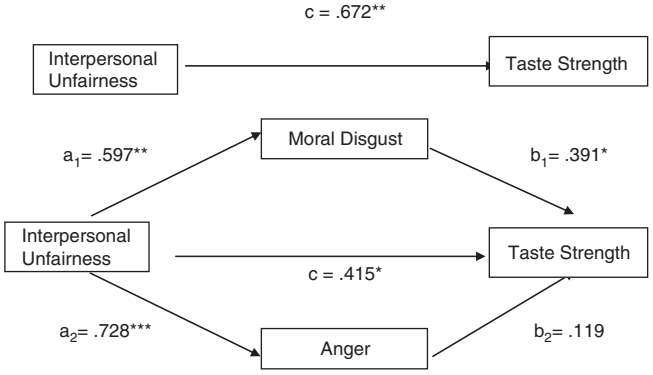

Fig. 2. Disgust and anger as mediators of the effect of Interpersonal Unfairness on Taste Strength (Study 2) (PROCESS Multiple Mediation Model 4; Hayes, 2012). Asterisks indicate significant regression paths (***$p < .001$,**$p < .01$, *$p < .05$).

General discussion

To date, most organizational justice research has emphasized the cognitive processes associated with fairness perceptions. The moral perspective of justice (Folger, 2001) proposes that both victims and third parties can also experience involuntary reactions to unfairness as a result of an evolutionary-based, reflexive response to violations of moral norms. Past studies, however, suggest that justice reactions give rise to anger, but not disgust. We hypothesized that a specific form of unfairness – violations of interpersonal justice – can also trigger socio-moral disgust which results in heightened sensitivity to taste and smells.

Folger and Skarlicki (2008) argued that individuals exhibit an innate response to injustice that has contributed to human survival. This response is theorized to occur because interpersonal injustice can activate a human alarm system that aids in detecting and reacting to potentially life-threatening situations (see also Eisenberger & Lieberman, 2004; Van den Bos et al., 2008). Interpersonal justice violations trigger disgust because the transgressor has violated principles of human dignity and therefore signals that he or she is a potential adversary. Since evolution has used oral disgust as a survival mechanism without changing its basic form to include the more social emotion of moral disgust, an injustice that triggers disgust can also affect taste

Table 4
Means, standard deviations, and correlations (Study 3).

	Mean	*SD*	1	2	3	4	5	6
1. Treatment	.52	.50						
2. Scent	.49	.50	.02					
3. Odor strength	6.36	1.72	.19*	−.51**				
4. Disgust	2.51	1.10	.25**	−.02	.23*	(.85)		
5. Odor enjoyment	4.89	2.41	.09	.46**	−.25**	-.02	(.95)	
6. Anger	3.17	1.14	.31**	−.04	.21*	.75**	.01	(.80)

Note: $N = 128$ for correlations not involving odor strength; $N = 121$ for correlations with odor strength; Treatment condition is coded fair (0), unfair (1) interpersonal justice; Odor Type is coded unpleasant (0), pleasant (1); Cronbach's Alphas are shown along the diagonal; ** $p < .01$; * $p < .05$.

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Table 5
Odor strength, enjoyment, and disgust results by condition (Study 3).

	Unfair			Fair		
	Bad odor	Good odor	Average	Bad odor	Good odor	Average
Odor strength	7.52 (.93)	5.79 (1.26)	6.69 (1.39)	6.90 (1.76)	5.16 (1.72)	6.03 (1.93)
	n = 31	n = 28	n = 59	n = 31	n = 31	n = 62
Odor enjoyment	4.26 (2.40)	5.98 (2.18)	5.10 (2.44)	3.31 (2.13)	6.05 (1.79)	4.68 (2.39)
	n = 34	n = 32	n = 66	n = 31	n = 31	n = 62
Disgust	2.75 (.98)	2.79 (.89)	2.77 (.93)	2.29 (1.28)	2.16 (1.15)	2.23 (1.21)
	n = 34	n = 32	n = 66	n = 31	n = 31	n = 62
Anger	3.54 (1.10)	3.47 (.92)	3.51 (1.01)	2.85 (1.14)	2.76 (1.19)	2.81 (1.16)
	n = 34	n = 32	n = 66	n = 31	n = 31	n = 62

and smell. An interesting aspect of our paper is that it illustrates the close connection between oral and moral disgust occurs in reaction to moral violations even when no oral danger is imminent (c.f., Rozin et al., 2009).

The present research demonstrates the importance of taking socio-moral disgust into account when trying to explain reactions to perceived injustice. We found that disgust accounted for increased taste and olfactory sensitivity over and above participants' anger-related emotions. This finding contrasts directly with Horberg et al.'s (2009) findings that anger, but not disgust, predicted harsher judgments of justice violations. One explanation for these differences is that we focused on interpersonal injustice that directly violates one's status as a moral being deserving of dignity and respect. As noted above, Horberg et al.'s (2009) justice violations (i.e., a student doesn't return a class textbook thus preventing another student from using it and a colleague interrupting another colleague during work meetings) might not have been construed as equally serious moral violations. As a result, they may not have elicited sufficiently strong reactions of socio-moral disgust. To clarify, we do not claim that interpersonal justice does not trigger anger or other emotions, only that disgust can have an observable mediation effect over and above anger emotions.

We also theorized and found that interpersonal injustice increases the perceived strength of a food product's taste without impacting enjoyment. This finding builds on a small body of recent research demonstrating that disgust elicited from observing moral transgressions can impact disgust judgments for beverages (Eskine, Kacinik, & Webster, 2012; Ritter & Preston, 2011). Consistent with an embodied cognition perspective, these authors have shown that the experience of moral disgust can translate into increased ratings of disgust for a beverage. However, the role of moral disgust on the positive, pleasurable aspects of taste is less clear. Ritter and Preston (2011) found that reading or copying a morally aversive text (e.g., a Christian copying the Q'uran) led to increased ratings of disgust for a beverage but had little to no impact on ratings of deliciousness. Eskine et al. (2012) showed that reading about moral transgressions (bribery, shoplifting) resulted in a beverage being rated as less delicious and more disgusting. However, their study employed a one-item measure with both disgusting and delicious as its anchors, so it is not possible to separate out the enjoyment aspects from the experience of disgust using their measure. Our finding of an effect on taste strength but no effect on taste enjoyment supports the possibility that disgust operates as part of the human alarm system and as such is separate from more hedonic aspects of the taste experience.

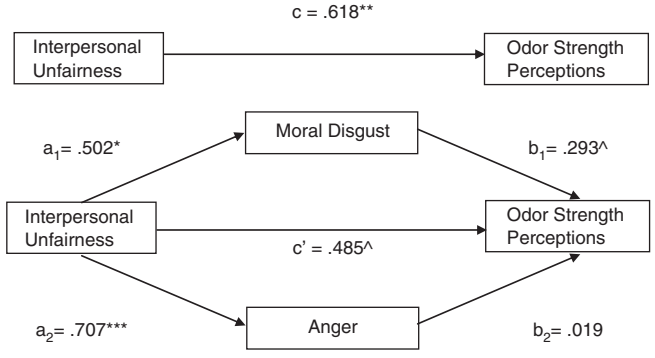

Fig. 3. Disgust and anger as mediators of the effect of Interpersonal Unfairness on Odor Strength (Study 3) (PROCESS Multiple Mediation Model 4; Hayes, 2012). Asterisks indicate significant paths (***$p < .001$, **$p < .01$, ^$p < .10$).

A strength of our research is that we tested for effects of interpersonal injustice on pleasant and unpleasant food and drink, as well as odors, which testifies to the robustness of our findings across different sensory modalities. Given that our general model is that interpersonal justice violations can affect a human alarm system, future research needs to test for the effects on other senses such as sight and sound.

One of the limitations of our studies is that participants self-reported their reactions; hence, we are unable to conclude that the effects were non-conscious, only that they were involuntary. On a related note, we assessed moral disgust after participants experienced unfairness, which may have inadvertently strengthened the mediation effects. Future research might use alternative methods to assess the unconscious activation of disgust, such as via a word scramble task (see Jones & Fitness, 2008). A second limitation concerns the scales used in Study 1 and 2. The taste strength measure was an index of two 7-point agree-disagree items asked in the present tense, whereas the taste enjoyment measure was an index of two 9-point unipolar scales worded in the past tense. These differences may have exaggerated the distinction between these two constructs and we cannot rule out the possibility that the scales had no impact on the results. Last, the participants in the present research were relatively young. Aging can reduce individuals' sensitivity to taste (Schiffman, 1997), thus future research needs to test whether these effects are attenuated with age.

Although we tested for the effects of interpersonal injustice on the senses because this type of workplace injustice was theorized to more readily trigger a moral response, this does not mean that other workplace justice violations (e.g., violations of outcomes or procedures) might *not* also be seen as a moral violation. Future research needs to more systematically investigate which types of organizational justice violations are more versus less likely to trigger moral reactions. Moreover, given theory that suggests that impurities give rise to disgust, and in light of our findings that interpersonal injustice triggers disgust, future research needs to test whether interpersonal injustice leads to perceived violations of physical, moral, or spiritual purity.

Some studies show that psychological harm systems contain an asymmetric sensitivity toward cues that indicate rejection over cues that indicate acceptance (e.g., Downey & Feldman, 1996). Future research might therefore explore whether individual differences such as disgust sensitivity (Jones & Fitness, 2008) moderate our findings. Also, research suggests that individuals can observe disgust in others. To the degree this is true, social learning theory (Bandura, 1986) and theories of emotional contagion (Barsade, 2002) would predict that by expressing disgust, individuals can impact the disgust emotions of the people around them.

In conclusion, we found that interpersonally unfair treatment can trigger disgust emotions, which can result in a non-voluntary reaction

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consisting in a heightened sensitivity to taste and smell. This effect was observed among both mistreatment victims and third parties. Collectively, our findings provide support for the existence among humans of involuntary processes that can be triggered by unfair treatment.

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