Evolutionary Psychology
July-September 2023: 1–8

DOI: 10.1177/14747049231179408
journals.sagepub.com/home/evp

No Support for Two Hypotheses About the Communicative Functions of Displaying Disgust: Evidence From Turkey, Norway, Germany, and Croatia

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Abstract

In recent years, researchers have discovered much about how disgust works, its neural basis, its relationship with immune function, its connection with mating, and some of its antecedents and consequents. Despite these advances in our understanding, an under-explored area is how disgust may be used to serve a communicative function, including how individuals might strategically downplay or exaggerate the disgust display in front of different audiences. Here, we generated two hypotheses about potential communicative functions of disgust, and tested these hypotheses in four countries (Turkey, Croatia, Germany, and Norway). We found no evidence in support of either hypothesis in any country. Discussion focuses on the likely falsity of the two central hypotheses, alternative interpretations of our findings, and directions for future research.

Keywords

disgust, evolution, emotion, communication, context effects

Date received: 15 December 2022. Revision Submitted 9 April 2023; Accepted 16 May 2023

Disgust is a universal emotion (Ekman, 1992, 1999; Waller et al., 2008) whose hypothesized evolved function is to reduce the likelihood of parasitic infection through behavioral avoidance of contaminants (Curtis et al., 2004; Tybur et al., 2013). In recent years, researchers have discovered much about how disgust works, its neural basis, its relationship with immune function, its connection with mating, and some of its antecedents and consequents (e.g., Fessler et al., 2005; Schaller & Duncan, 2007; Schaller & Murray, 2008; Curtis et al., 2011; Fleischman & Fessler, 2011; Schaller, 2011; Tybur et al., 2013, 2020; Al-Shawaf, Lewis, Alley et al., 2015; Al-Shawaf, Lewis, & Buss, 2015; Al-Shawaf & Lewis, 2017; Al-Shawaf et al., 2018; Jones et al., 2018; Kennair et al., 2018). Despite these advances in our understanding of disgust, an under-explored aspect of this emotion is how it may be used to communicate important information to others.

One existing hypothesis suggests that an individual's disgust levels may be indicative of their immune function. This hypothesis holds that a person's willingness to approach potential contaminants is an (inverse) indicator of that person's immune robustness (Fessler et al., 2004). Stated differently, those who have weaker immune systems may be warier around contaminants than those with more robust immune systems (Fessler et al., 2004).

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If correct, this relationship between immune function and disgust could have created selection pressures for observers to make inferences about the strength of a person's immune system based on the disgust levels exhibited by that individual. This would have set up further selection pressures for individuals to modulate their expression of disgust in order to influence observers' perception of their health and immune robustness. Specifically, one might signal low levels of disgust to create the perception of a more robust immune system in the minds of observers.

Because immune function and health are important in mate selection (e.g., Tybur & Gangestad, 2011), one might expect this downplaying of disgust to be more pronounced in the presence of potential mates. We call this the *Immunological Display Hypothesis* (see also Al-Shawaf, Lewis, Alley et al., 2015; Al-Shawaf et al., 2016). It yields the prediction that the presence of potential mates will induce people to display lower disgust levels.

A second, distinct hypothesis about disgust holds that a willingness to approach contaminants conveys not immune robustness specifically, but rather a general willingness to take physical risks. Risk-taking makes one appear more formidable (Fessler et al., 2014). Because exposing oneself to pathogens is a form of risk-taking, a willingness to do so may be an indicator of one's overall formidability. And because overall formidability is a key component of a person's coalitional value (it makes one a valuable coalitional ally and a daunting opponent; Fessler et al., 2014), this suggests that willingness to expose oneself to pathogens might create the impression of being a more formidable ally or rival. Theoretically, this is predicted to matter most in same-sex interactions among men, who are the demographic most likely to enter agonistic coalitions, and who place a premium on bravery and formidability in their allies (Fessler et al., 2014). This hypothesis is derived from a broader hypothesis called the Crazy Bastard Hypothesis (Fessler et al., 2014), which states that risk-proneness indicates a willingness to confront danger, thereby making one a more formidable ally and enemy. Here, we advance and test a more specific, derivative hypothesis: The *Pathogen Risk-Taker Hypothesis*. This hypothesis predicts that the presence of a same-sex audience will induce people to display lower disgust levels.

In sum, the *Immunological Display Hypothesis* suggests that disgust conveys immunological robustness, and yields the prediction that people will downplay disgust in front of an audience of opposite-sex others. By contrast, the *Pathogen Risk-Taker Hypothesis* suggests that disgust conveys willingness to take risks and thus formidability, and yields the prediction that people will downplay disgust in front of same-sex others.

We tested these two hypotheses using a 2 x 2 x 4 between-subjects experimental design. Our three independent variables were (1) experimental condition (same-sex audience vs. opposite-sex audience), (2) a quasi-independent variable of participant sex (male vs. female), and (3) a quasi-independent variable of country (Turkey, Norway, Germany, and Croatia).

Method

Participants

Participants included heterosexual and bisexual males and females from Croatia [$N = 82$; 31 males ($M_{age} = 29.16$, $SD = 8.69$, range: 21–50), 51 females ($M_{age} = 26.13$, $SD = 5.61$, range: 19–45)], Norway [$N = 88$; 38 males ($M_{age} = 23.59$, $SD = 2.79$, range: 18–31), 50 females ($M_{age} = 22.58$, $SD = 2.55$, range: 19–32)], Germany [$N = 147$; 75 males ($M_{age} = 23.65$, $SD = 4.58$, range: 18–49), 72 females ($M_{age} = 22.00$, $SD = 3.50$, range: 18–32)], and Turkey [$N = 82$; 48 males ($M_{age} = 20.02$, $SD = 1.21$, range: 18–23), and 34 females ($M_{age} = 19.79$, $SD = 1.43$, range: 18–24)]. Participants were excluded from analysis if they did not declare their gender, or if their primary sexual orientation was something other than heterosexual or bisexual. Sample size was determined by what was feasible for each researcher in each country during the allotted time for the study, and the study was approved by the Ethics Board at Bilkent University in Turkey. All data were collected before the Covid-19 pandemic.

Materials

To test whether same-sex or opposite-sex audiences induced lower reported disgust, we included disgust and perceived vulnerability to disease as dependent variables. However, both the *Three Domain Disgust Scale* (TDDS) and the *Perceived Vulnerability to Disease* (PVD) scale are typically conceptualized as trait measures, and may thus be relatively insensitive to transient context-specific demands. We therefore also included a researcher-generated scale intended to index current, state-level disgust.

Current Disgust. This researcher-generated scale consisted of three items—two from a previous study (Al-Shawaf et al., 2018) plus one additional item (How concerned with disease do you feel right now?). The scores on the three items were averaged. To normalize participant responses, current disgust scores were standardized based on within-country means and standard deviations.

Three Domain Disgust Scale. The Three Domain Disgust Scale is arguably the most conceptually and psychometrically sound existing measure of disgust (Tybur et al., 2009, 2013; Al-Shawaf & Lewis, 2013). It measures three different domains of disgust—pathogen, sexual, and moral. Sample items from the pathogen subscale include "sitting next to someone who has red sores on their arm" and "standing close to a person who has body odor". Sample items from the sexual subscale include "performing oral sex" and "hearing two strangers having sex." Sample items from the moral subscale include "deceiving a friend" and "intentionally lying during a business transaction." To normalize participant responses, TDDS scores were standardized based on within-country means and standard deviations.

Perceived Vulnerability to Disease. Perceived Vulnerability to Disease (PVD; Duncan et al., 2009) is a scale that indexes the extent to which a person is (a) averse to germs and (b) thinks of themselves as vulnerable to disease. Sample items from the Germ Aversion subscale include "I prefer to wash my hands pretty soon after shaking someone's hand" and "It really bothers me when people sneeze without covering their mouths." Sample items from the Perceived Infectability subscale include "I have a history of susceptibility to infectious diseases" and "My immune system protects me from most illnesses that other people get" (reverse-scored). To normalize participant responses, PVD scores were standardized based on within-country means and standard deviations.

Sociosexual Orientation Inventory-Revised. The Sociosexual Orientation Inventory-Revised (SOI-R) (Penke & Asendorpf, 2008) is a nine-item measure of an individual's disposition toward (or away from) uncommitted sex. Sample items include "With how many different partners have you had sex within the past 12 months?" (behavior subscale), "How often do you experience sexual arousal when you are in contact with someone you are not in a committed romantic relationship with?" (desire subscale), and "I can imagine myself being comfortable and enjoying 'casual' sex with different partners" (attitude subscale). Scale items are summed to form a composite SOI-R score, with higher scores reflecting a stronger short-term mating orientation.

Instead of using global Sociosexual Orientation scores, we calculated a composite sociosexual score that included the attitude and desire subscales, but excluded behavior (SOI-AD). We purposely excluded the behavior subscale because it is affected by numerous factors, including one's own mate value and one's pool of prospective mates, and therefore does not represent a "pure" measure of orientation toward short-term mating. After standardizing SOI-AD scores based on within-country means and standard deviations, we included it as a covariate in our analyses, because individuals with very low willingness to engage in short-term mating may be unaffected by our experimental manipulation, especially if downplaying disgust is driven by mating motives as per the immunological display hypothesis.

Perceptions of Attractiveness. The *Immunological Display Hypothesis* suggests that people will downplay their disgust when their mating motives are activated. The presence of an opposite-sex audience is not a sufficient condition for this; the person must be attracted to at least one of the members of the audience. We therefore asked participants how attractive they found the experimenter and how attractive they found the confederate (described below) on a scale of 1–7, and included these attractiveness measures as separate covariates in our analyses.

Procedure

Participants were randomly assigned to one of two experimental conditions: same-sex or opposite-sex audience. In the same-sex condition, the confederate and experimenter were of the same sex as the participant. In the opposite-sex condition, the confederate and experimenter were of the opposite sex as the participant. The purpose of having a confederate in addition to the experimenter was to amplify the presence of same-sex or opposite-sex others and to create the impression that someone from the participant's peer group was present in addition to the researcher, who may be regarded as an authority figure rather than a peer. The protocol for the confederate was to sit in silence and appear to work on something at a different computer, but in the same laboratory and clearly within earshot (an important feature of study design described in more detail below).

Participants completed a variety of demographic questions and then sat through a slideshow of 19 images intended to trigger pathogen disgust (Al-Shawaf et al., 2018; all materials available from the first author upon request). After the slideshow, the experimenter collected participants' responses to the study measures verbally. This was a key facet of study design intended to magnify the salience of the audience—this verbal interview made the presence of the researcher and confederate more salient to the participant, as opposed to having participants complete study measures privately in a written format without the researcher or confederate being able to hear the participant's responses. The researcher thus solicited the participant's answers, out loud, to the Three Domain Disgust Scale, Perceived Vulnerability to Disease scale, and Current Disgust, and recorded these on behalf of the participant. After this portion of the study, the experimenter gave the participant access to the computer again and left the room.

This enabled the participant to answer the last two questions – which were about how attractive the participant found the experimenter and confederate – privately. The participant then encountered a debriefing screen and completed the study.

Results

Overview

Factor analysis revealed no substantial shared variability between the three dependent measures. We therefore proceeded to conduct analyses on each of the three dependent variables independently. Across all four countries, we found little to no evidence of an effect of experimental condition (same-sex vs. opposite-sex audience) on trait disgust, current disgust, or perceived vulnerability to disease. In all four countries, we replicated the well-established finding that women have higher levels of disgust than men (Tybur et al., 2011; Al-Shawaf & Lewis, 2013; Al-Shawaf et al., 2017). We also found that scores on the SOI-AD were negatively correlated with scores on the TDDS, replicating the finding that short-term mating strategies are associated with lower trait disgust (Al-Shawaf, Lewis, & Buss, 2015; Al-Shawaf et al., 2018; O'Shea et al., 2019). Table 1 displays the means and standard deviations for the study variables, separated by country.

Table 1. Unstandardized Means (SDs) for Three Domain Disgust Scale, Perceived Vulnerability to Disease, Current Disgust, Sociosexual Orientation (Attitude-Desire Composite), and Experimenter & Confederate Attractiveness Ratings Across Cultures.

		TDDS	PVD	Current disgust	SOI-AD	Exp. attract	Conf. attract
Croatia							
	Males	61.60***	39.97**	3.04	35.65***	4.63*	4.33
		(16.42)	(10.22)	(1.09)	(7.65)	(0.85)	(0.84)
	Females	78.72***	48.60**	3.43	27.65***	5.10*	4.54
		(17.26)	(13.95)	(1.27)	(10.35)	(0.99)	(0.82)
Norway							
	Males	73.47***	43.78	3.39	37.39***	5.16	4.95
		(17.75)	(14.55)	(1.20)	(9.30)	(0.92)	(0.84)
	Females	89.86***	48.64	3.61	28.66***	5.02	5.00
		(18.28)	(13.33)	(1.04)	(10.67)	(1.12)	(1.07)
Germany							
	Males	68.43***	46.55*	3.43*	33.03***	5.00	4.64
		(19.54)	(13.58)	(1.17)	(10.98)	(1.07)	(1.05)
	Females	79.66***	51.43*	3.88*	22.19***	9.96	4.58
		(19.03)	(14.73)	(1.26)	(9.92)	(0.86)	(0.78)
Turkey							
	Males	68.94*	49.71	3.83	27.5***	4.40	4.08
		(20.07)	(13.61)	(1.56)	(12.14)	(1.32)	(1.35)
	Females	79.70*	52.52	3.84	18.5***	4.49	4.35
		(21.25)	(10.94)	(1.63)	(9.68)	(0.74)	(0.88)

TDDS = Three Domain Disgust Scale; PVD = perceived vulnerability to disease; SOI-AD = Sociosexual Orientation Inventory Attitude and Desire Subscales. * .05 ; ** .01; *** .001. Asterisks refer to comparisons between males and females.

Current Disgust

We conducted a three-way ANCOVA with condition (same-sex vs. opposite-sex audience), participant sex (male vs. female), country (Turkey, Croatia, Germany, and Norway), and their interactions as predictors of current disgust scores. Additionally, the model included, as covariates, SOI-AD scores as well as participants' ratings of the experimenter's and confederate's attractiveness. Results revealed no significant two- or three-way interactions involving the country variable, suggesting that any effects of the experimental conditions or other predictor variables were not moderated by country $F(3,373) = 0.007$, $p > .95$. Results also revealed no significant effect of any of the covariates. We therefore collapsed the data across the four countries and conducted a two-way ANOVA with experimental condition, participant sex, and their interaction entered as predictors. This revealed no significant interaction and no significant main effect of condition, but a main effect of sex $F(1,393) = 5.20$, $p < .05$. Consistent with previous research, current disgust scores were significantly greater among women compared to men $t(395) = -2.41$, $p < .05$, $d = .24$.

Trait Disgust (TDDS)

We conducted an identical set of analyses with Trait Disgust as the dependent variable. Results revealed no significant three-way interactions with country, so the three-way term was removed from the model. The two-way interaction between condition and country was significant at $F(3, 369) = 2.96$, $p = .03$. However, simple effects analyses revealed there were no significant differences in trait disgust scores between conditions in any of the four countries, suggesting that the two-way interaction between condition and country was likely a spurious effect. We detected a main effect of participant sex $F(1,369) = 57.19$, $p < .001$. Consistent with previous research, trait disgust scores were significantly greater among women compared to men $t(390) = -7.01$, $p < .001$, $d = .71$. Furthermore, even after controlling for SOI-AD scores, which were significantly related to trait disgust scores, this main effect of sex was still present, $F(1, 369) = 34.56$, $p < .001$.

We also re-ran this same analysis using only pathogen trait disgust (TDDS-Pathogen) as the outcome variable, rather than overall trait disgust (TDDS-Overall), because the pathogen disgust subscale is the one most conceptually relevant for the hypotheses being tested. Again, the analysis revealed no significant three-way interactions with country, but the two-way interaction between the condition and country was significant, $F(3, 373) = 4.35$, $p = .005$. Simple effects revealed a difference between conditions with the Norway sample, $t(86) = -3.23$, $p < 0.002$, but no between-condition differences in any of the other countries (Croatia, Germany, and Turkey). We again observed a main effect of participant sex $F(1,373) = 23.9$, $p < .001$; pathogen disgust scores were significantly greater among women than men, $t(394) = -4.48$, $p < .001$, $d = .45$. Finally, we found no significant effect of SOI-AD scores on pathogen disgust.

This pattern of results largely aligns with the results for global trait disgust, with the exception of one significant difference between conditions for pathogen disgust (Norway), as opposed to none for global trait disgust. We suspect that the

significant effect in Norway was spurious , considering the pattern of results for all the other countries, and given the null results for global (trait) disgust, current (state) disgust, and trait perceived vulnerability to disease.

Perceived Vulnerability to Disease

We conducted an identical set of analyses with Perceived Vulnerability to Disease as the dependent variable. Results revealed no significant two- or three-way interactions with country, so we collapsed the data across all countries. Results also revealed no significant effect of any of the covariates. A two-way ANOVA with experimental condition, participant sex, and their interaction revealed no significant interaction and no significant main effect of condition, but a main effect of sex $F(1,385) = 14.09$, $p < .001$. Consistent with previous research, standardized PVD scores were significantly greater among women compared to men $t(387) = -3.73$, $p < .001$, $d = .38$.

Discussion

Our results revealed no effect of experimental condition, or of an interaction between experimental condition and participant sex, on any of the key dependent variables of trait disgust, state disgust, or perceived vulnerability to disease. These null findings held across all four countries (Turkey, Germany, Norway, and Croatia), and remained true after statistically controlling for plausible covariates (sociosexual orientation and participants' perceptions of experimenter attractiveness and confederate attractiveness).

The most parsimonious interpretation of these results is that both hypotheses tested in this study—the *Immunological Display Hypothesis* and the *Pathogen Risk-Taker Hypothesis*—are false. This interpretation is buttressed by some of the methodological features of this study, such as the experimental and cross-cultural nature of the study, the inclusion of both trait and state measures, the inclusion of a confederate in addition to the experimenter to amplify the effect of the audience, and the interviewing-out-loud portion of the study to increase the salience of the presence of the audience. Given these methodological strengths, together with the fact that neither hypothesis received support—and this remained true after controlling for plausible covariates—we think that the most plausible interpretation is that neither hypothesis is correct. In support of this interpretation, a recent high-powered study from an independent laboratory in a different country that included additional controls also did not find reduced disgust displays in the presence of same-sex or opposite-sex others (Stefanczyk et al., 2022). However, in the Limitations section we consider a few other possibilities, including potential flaws in our study design.

Consistent with previous studies (Curtis et al., 2004; Tybur et al., 2009; Al-Shawaf et al., 2017), we found a main effect of participant sex in all four cultures: women were more disgust-sensitive than men. Similarly, women perceived themselves to be more vulnerable to disease than men in Croatia, Germany, and marginally in Norway, and had higher current (state) disgust than men in Germany. These findings reinforce the finding that women tend to be more pathogen-averse than men (Curtis et al., 2004; Tybur et al., 2011, 2013; Al-Shawaf et al., 2017). Additionally, and also in line with existing findings, a proclivity for short-term mating was associated with lower disgust sensitivity (Al-Shawaf, Lewis, & Buss, 2015; Al-Shawaf et al., 2018 O'Shea et al., 2019).

We wish to stress two things before considering alternative interpretations of our results. First, although our data appear to offer a preliminary refutation of the two hypotheses tested in this study, they clearly do not refute the broader hypotheses from which these two were derived. In other words, our data do not refute the more general hypothesis that immune function may be related to disgust (from which the *Immunological Display Hypothesis* was derived), nor do they refute Fessler et al.'s (2014) *Crazy Bastard Hypothesis* (from which the *Pathogen Risk-Taker Hypothesis* was derived). This is because the broader hypotheses do not strictly logically entail the more specific hypotheses tested in this study, and our data only speak to the more specific hypotheses. Our null findings are therefore properly interpreted as a tentative refutation of the two specific hypotheses tested in this study, but not the broader hypotheses that inspired them. We stress this because we think it is important to interpret results at the correct level in the theoretical hierarchy of middle-level theories, broad hypotheses, and more specific hypotheses (Buss, 1995; Al-Shawaf et al., 2016; Lewis et al., 2017).

Second, our data show that people's levels of disgust do not differ between same-sex and opposite-sex experimental conditions. However, these data cannot address whether people might behave differently in the presence of an audience versus in the absence of an audience. In other words, while these data suggest that the gender of the audience appears not to matter, it remains an open empirical question whether the *presence* of an audience, irrespective of its composition, matters. We discuss this issue further below.

Limitations and Future Directions

We think the most plausible interpretation of these findings is that both hypotheses are incorrect. However, another possibility is that the Immunological Display Hypothesis and Pathogen Risk-Taker Hypothesis might *both be correct*. Our study design leaves open this possibility because we did not include a no-audience control; we only included same-sex and opposite-sex conditions. As a consequence, *if both hypotheses were correct* and *their postulated effects were exactly equal in magnitude*, then we also would have observed the current results (i.e., no difference between opposite-sex and same-sex conditions). Strictly speaking, then, our results cannot rule out the possibility that both hypotheses are correct and of equal magnitude.

However, while not perfectly conclusive, considerations of parsimony suggest that it is more plausible that both hypotheses are incorrect than that both hypotheses are correct *and* that their

postulated effects are exactly equal in magnitude across all four countries. Overall, these considerations lead us to suggest that both hypotheses are likely incorrect—a conclusion that must remain tentative due to the caveats discussed in this section.

Some methodological limitations constrain our conclusions. First, our study took place in the lab in university settings, thereby potentially limiting generalizability to more naturalistic contexts. Second, our dependent variables were self-reported trait disgust, state disgust, and perceived vulnerability to disease. We chose self-report because our hypotheses indeed predict an effect on self-reported disgust specifically – but it is nonetheless possible that we would have obtained different results with behavioral measures. Conducting similar studies in the future with behavioral measures of the dependent variables, including facial expressions, eating behavior, or behaviorally handling contaminants, would thus be valuable. Third, we may have had insufficient power to detect the effect predicted by either the Immunological Display Hypothesis or the Pathogen Risk-Taker Hypothesis, but we consider this interpretation relatively unlikely given the primarily null results reported by both our team and Stefanczyk and colleagues (2022). Fourth and finally, it is conceivable that our stimuli and/or operationalization of variables affected our results. For example, our disgusting stimuli were all extremely disgusting visual images (taken from Al-Shawaf et al., 2018). Previous studies using these same images have shown that visually induced disgust, especially visually induced sexual disgust, can be quite powerful in its effects (Al-Shawaf et al., 2018). It is possible that these stimuli were too potent, inducing a level of disgust that was relatively immune to attenuation by audience effects. Future studies that adopt less disgusting images, or stimuli targeting a different perceptual modality (for example, olfactory or tactile), might produce a different outcome. Such a possibility cannot be addressed with our data and must await future empirical tests.

A distinct and important direction for future research lies in the psychology of the audience members. To understand disgust displays or the suppression thereof, future research should attend to the *effect of these displays on observers*: do people actually find those who display lower disgust to be more attractive or more formidable? To obtain a complete picture of the relationship between disgust sensitivity and attractiveness as a mate or coalitional ally, future research should also take into account individual differences among observers. For example, given that people tend to be more attracted to risk-taking in short-term mating contexts (Kelly & Dunbar, 2001), and given that those oriented toward short-term mating tend to be lower in disgust (Al-Shawaf, Lewis, & Buss, 2015), advertising low levels of disgust may be more useful with audience members who have a stronger proclivity for short-term mating. Similarly, the utility of advertising low levels of disgust may vary as a function of the ecology's pathogen load, the observer's immunocompetence, and other key contextual variables.

Additionally, future research should take into account the fact that while exhibiting low disgust may be beneficial up to a certain threshold, there can also be costs to appearing *too* low in disgust. For example, individuals whose disgust levels are so low that they recklessly endanger themselves, and then pose a transmission risk to friends, allies, and mates, can expect to face costs such as shunning and ostracism. Consequently, future research would do well to differentiate between different levels of pathogen threat, with the expectation that signaling low disgust is socially useful in some contexts but not others, and with the expectation that signaling extremely low disgust may have negative social effects—especially in response to severe pathogen threats.

Future research seeking to understand the relationship between disgust sensitivity and attractiveness as an ally or mate should also measure observers' perceptions of the displayer's health and disease resistance, as well as strength and risk-taking, so as to determine if these variables mediate any relationship between downplaying disgust and appearing more or less attractive as an ally or mate. Finally, while this study focused on pathogen disgust, there may be distinct communicative functions involved in displaying sexual disgust or moral disgust, another direction worth pursuing in future research.

Conclusion

In a cross-cultural experiment investigating two disgust hypotheses in four countries, we found no support for either the *Immunological Display Hypothesis* or the *Pathogen Risk-Taker Hypothesis*. As expected, and replicating previous findings, we found that women exhibited higher disgust than men (Curtis et al., 2004; Tybur et al., 2011; Al-Shawaf et al., 2017) and that a proclivity for short-term mating is associated with lower levels of disgust (Al-Shawaf, Lewis, & Buss, 2015). Given the design of the experiments and the pattern of results across countries, we suggest that the most plausible interpretation of our findings is that both hypotheses are incorrect. However, it remains possible that future studies using different stimuli, or employing dependent variables of a different nature (e.g., behavioral measures), or carried out in more naturalistic fashion (as opposed to our laboratory experiments), might yield different results. We therefore tentatively reject both hypotheses tested in this set of studies, but encourage researchers to test them using different methods and different stimuli to see if these null findings replicate or are overturned.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Publication of this article was funded by the University of Colorado Colorado Springs Open Access Fund.

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