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Disgust sensitivity and opposition to immigration: Does contact avoidance or resistance to foreign norms explain the relationship?

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ABSTRACT

Past research suggests that pathogen-avoidance motives (e.g., disgust sensitivity) relate to greater opposition to immigration. Two accounts have been proposed to explain this relationship, one of which emphasizes proximally avoiding outgroups, and the other of which emphasizes adherence to traditional norms. According to the former, immigrants are perceived as being more infectious because they carry novel pathogens due to their foreign ecological origins. According to the latter, immigrants' foreign norms are perceived as posing a pathogen threat. This study aimed to disentangle these accounts. Participants ($N = 975$) were randomly assigned to read a description of an immigrant who had high or low contact with locals and high or low assimilation to local norms. The effect of disgust sensitivity on sentiments toward the immigrant (and immigrants like him) was compared across conditions. Results supported the traditional norms account: disgust sensitivity related to anti-immigrant sentiments when the immigrant was described as not assimilating to local norms, but not when he was described as assimilating. Contrary to the outgroup avoidance account, the relationship between disgust sensitivity and anti-immigrant sentiments did not vary across the high-contact and low-contact conditions. Results suggest that resistance to foreign norms, rather than avoidance of novel pathogens, better explains the relationship between pathogen avoidance and outgroup prejudice.

1. Introduction

> "*We should build a wall of brass around the country*." – John Jay, first chief justice of the United States Supreme Court, 1750s.

> "*I would build a great wall, and nobody builds walls better than me, believe me, and I'll build them very inexpensively, I will build a great, great wall on our southern border*." – Donald Trump, the 45th President of the United States, 2015.

For centuries, people have built walls, fences, and fortresses to restrict immigration. In contemporary European and North American societies, Middle-Eastern and African immigrants have especially faced opposition from native-born people (Telhami, 2016; Wike, Stokes, & Simmons, 2016). This opposition is undergirded by perceptions that immigrants pose a variety of threats, including economic threats (Mayda, 2006; Scheve & Slaughter, 2001), criminal threats (Alba, Rumbaut, & Marotz, 2005; Nunziata, 2015; Wang, 2012), and threats to national identity (Hainmueller & Hopkins, 2014; Newman, Hartman, & Taber, 2012; Sniderman, Hagendoorn, & Prior, 2004). People respond to such perceived threats with different emotions (Cottrell & Neuberg, 2005). For instance, groups perceived as posing economic threats evoke anger, whereas groups perceived as posing physical violence threats evoke fear (Cottrell & Neuberg, 2005). And, especially pertinent to this paper, groups perceived as posing an infectious disease threat evoke disgust – the key motivational component of the behavioral immune system (Ackerman, Hill, & Murray, 2018; Murray & Schaller, 2016; Tybur, Lieberman, Kurzban, & DeScioli, 2013).

Accordingly, growing evidence suggests that the behavioral immune system influences sentiments toward immigrants, with multiple studies indicating that individuals who experience more pathogen disgust harbor more negative attitudes toward foreigners (Aarøe, Petersen, & Arceneaux, 2017; Brenner & Inbar, 2014; Faulkner, Schaller, Park, & Duncan, 2004; Green et al., 2010; Hodson et al., 2013; Hodson & Costello, 2007). Further, one study found that dispositional and experimentally induced pathogen-avoidance motives relate to less favorable attitudes toward immigrants from exotic (e.g., Mongolians for Canadians) – but not familiar (e.g., Scottish for Canadians) – nations (Faulkner et al., 2004), and another found that pathogen-avoidance motives similarly relate to ethnocentrism and ingroup attraction (Navarrete & Fessler, 2006). Another cross-sectional study of pregnant

women found that ethnocentrism and ingroup attraction were highest during the first trimester of pregnancy, when physical immune responses are compromised (Navarrete, Fessler, & Eng, 2007). This finding was interpreted as suggesting that immunosuppressed women navigate the pathogen threats posed by foreigners by increasing their intergroup biases. Finally, another study found that, when the threat of avian influenza was made salient, those holding unfavorable attitudes toward immigrants more strongly endorsed avoiding contact with immigrants as a strategy for avoiding the disease (Krings et al., 2012).

In sum, a body of existing work suggests that sentiments toward immigrants are partially shaped by pathogen-avoidance motives. But why does this relationship exist? Two accounts have been proposed, but they have yet to be directly tested experimentally. The first account is tied to physical proximity – it suggests that immigrants are perceived as being more infectious given their distant home ecology. The second account is tied to foreign norms – it suggests that immigrants' traditions and customs are perceived as posing a pathogen threat. The aim of this study was to disentangle these accounts.

1.1. Outgroup avoidance versus traditional norms

According to the first explanation, the behavioral immune system relates to anti-immigrant sentiments because immigration increases proximity to individuals from foreign ecologies. This argument is based on the idea that different pathogens are endemic to different ecologies. Because people adapt locally (e.g., develop specialized resistance or tolerance) to the pathogens in their own ecologies, interactions with individuals from different ecologies (who carry different pathogens) present a novel infectious disease threat (Fincher & Thornhill, 2008a, 2008b; Roberts, 1989; Thornhill, Fincher, & Aran, 2008; cf. de Barra & Curtis, 2012; Petersen, 2017; Van Leeuwen & Petersen, 2018). According to this *outgroup avoidance account*, the relationship between pathogen avoidance and anti-immigrant sentiments is caused by perceptions that immigration increases the risk of contact with individuals from foreign ecologies.

According to the second explanation, the behavioral immune system relates to anti-immigrant sentiments because immigrants are perceived as following foreign cultural rules. This account is based on the assumption that cultural rules evolve partially to neutralize pathogens (Murray, Trudeau, & Schaller, 2011). Examples include the processing and preparation of foods (e.g., which antimicrobial spices are used in cooking; Sherman & Billing, 1999) and the coordination of which hand is used in ablutions. From this perspective, the relationship between pathogen avoidance and anti-immigrant sentiments is caused by perceptions that immigrants follow different traditional cultural norms than do native-born individuals (Fincher, Thornhill, Murray, & Schaller, 2008). Following Tybur et al. (2016), we refer to this as the *traditional norms account*.

Although past research has found an association between pathogen avoidance and anti-immigrant sentiments, it has not directly differentiated between the outgroup avoidance account and the traditional norms account as explanations for this relationship. For instance, the stronger relation between pathogen avoidance and negative attitudes toward exotic (vs. familiar) immigrant groups (Faulkner et al., 2004) may derive either from exotic immigrant groups coming from a more distant home ecology, or from them following more foreign traditions than familiar immigrant groups. Similarly, increased ethnocentrism when physical immune system responses are compromised (Navarrete et al., 2007), or when pathogens are either temporarily or chronically salient (Navarrete & Fessler, 2006), can motivate avoidance of outgroup members due to their ecological origins or their customs.

Although preliminary evidence is consistent with both accounts, no study has directly contrasted the outgroup avoidance and traditional norms accounts. For example, Aarøe et al. (2017) found that, in a Danish sample, the contamination subscale of the Disgust Scale Revised (Olatunji et al., 2007) predicted the degree to which individuals were

bothered by situations involving close contact with immigrants (e.g., an immediate family member marrying an immigrant; having an immigrant family as neighbors). However, as noted by Aarøe and colleagues, these situations also conveyed information about immigrants' exposure to (and, hence, adoption of) local cultural norms. In another study conducted in the United States, Aarøe and colleagues found that portraying immigrants as willing to learn English and adopt democratic values did not alleviate anti-immigrant sentiments of those high in disgust sensitivity, suggesting that immigrants' assimilation to local norms does not attenuate the relationship between pathogen avoidance and sentiments toward immigrants. Yet, English language abilities and democratic values are a limited subset of the norms followed by Americans, and they might not be the types of norms that are most relevant to our pathogen avoidance psychology. Further, these types of behaviors might also convey information about immigrants' physical proximity to native-born individuals. Finally, in a cross-cultural study of 30 nations, Tybur et al. (2016) found that disgust sensitivity relates more strongly to traditionalism – an ideological dimension that especially relates to antipathy toward those who violate traditional norms – than to social dominance orientation (SDO), which especially relates to antipathy toward racial and ethnic outgroups (Tybur et al., 2016). This study did not assess sentiments toward immigrants, though.

In short, the literature has yet to cleanly adjudicate between the traditional norms account and the outgroup avoidance account of pathogen avoidance and anti-immigrant sentiments. The current study aimed to directly test and contrast predictions drawn from these accounts by experimentally manipulating information about a specific immigrant's contact with native-born individuals and that immigrant's adoption of local norms and traditions.

To accomplish this goal, we adopted and further adapted a method developed by Thomsen, Green, and Sidanius (2008). Their approach involved presenting participants with a scenario of an immigrant who either assimilated to local norms or not, and subsequently measuring participants' willingness to persecute immigrants. Thomsen and colleagues' findings indicated that right wing authoritarianism (RWA) – a form of conservatism encompassing traditionalism, authoritarian aggression and authoritarian submission – is associated with a willingness to persecute immigrants who do not assimilate to local norms, and thus undermine group conformity. In contrast, Thomsen and colleagues found that SDO is associated with a willingness to persecute immigrants particularly when they do assimilate to local norms, putatively diminishing the hierarchical segregation between groups.

In this study we presented participants with scenarios describing an immigrant whose level of cultural assimilation and physical proximity to locals (hereafter assimilation vs. contact) was independently manipulated, and we subsequently measured participants' sentiments toward this immigrant and other immigrants like him. We then tested whether disgust sensitivity differentially related to anti-immigrant sentiments across scenarios. We also measured traditionalism and SDO, which allowed us to examine whether the findings by Thomsen et al. (2008) hold with our scenarios and measure of anti-immigrant sentiments. To the best of our knowledge, no replication attempts of these findings have been published.

2. Predictions

To disentangle the outgroup avoidance and the traditional norms accounts, we derived the following contrasting predictions:

1) **The outgroup avoidance account**. Disgust sensitivity will be more strongly associated with anti-immigrant sentiments when the immigrant is described as being in contact with the locals.
2) **The traditional norms account**. Disgust sensitivity will be more strongly associated with anti-immigrant sentiments when the immigrant is described as not assimilating to local norms and traditions.

We note that the traditional norms account might also predict a moderating effect of contact. That is, any pathogen threat associated with norm violations might be exacerbated by greater contact. Hence, we also tested for the three-way interaction between disgust sensitivity, contact, and assimilation.

To construct materials for the study that tested these predictions, we first ran two pilot studies. The purpose of the pilot studies was to construct and validate scenarios for the manipulation, and to choose the dependent measures for the main study. In these studies, we report all measures, manipulations and exclusions.

3. Non-registered studies

3.1. Pilot Study 1

We first developed scenarios describing an immigrant who either assimilates or does not assimilate to U.S. culture, and who either is in contact with people who grew up in the U.S. (but not with other immigrants) or with other immigrants (but not with people who grew up in the U.S.). The purpose of the pilot study was to test whether the scenarios differentiated between perceived assimilation and contact with the locals as intended, and to choose the dependent measure for the main study. We also aimed to use results from the pilot study to inform power analyses for the main study.

3.1.1. Method

3.1.1.1. Participants. Participants were recruited through Amazon Mechanical Turk (MTurk) and restricted to U.S. citizens above 18 years of age. We recruited 162 participants (68 female, 1 other gender identity), ranging from 19 to 68 years of age ($M = 36$, $SD = 11.3$). Sample size was decided before any data analysis was conducted.

3.1.1.2. Procedure. Participants received a link to a Qualtrics survey and provided informed consent. They then read a description of an immigrant. Following Thomsen et al. (2008), the immigrant in the scenarios was always male. Assimilation and level of contact were manipulated in a 2 × 2 factorial design. After reading the description, participants answered 12 questions intended to assess sentiments toward the immigrant and other immigrants like him. The pilot study also included the dependent variable used by Thomsen and colleagues: a measure of willingness to persecute immigrants. Participants then answered manipulation check questions regarding the immigrant's contact with locals and his adoption of American norms and customs. They also answered questions regarding the immigrant's adoption of local hygiene, food preparation, sexual and religious practices. The purpose of these questions was to examine whether participants infer the immigrant's adherence to norms relevant to pathogen avoidance from his adherence to local norms in general. Finally, participants provided demographic information; namely, age, gender, education, income and self-ascribed social class. Participants were then debriefed and compensated.

3.1.2. Materials

All materials are described in full detail in the Open Science Framework (OSF) platform (osf.io/tcuap).

3.1.2.1. Manipulation. Participants read a description of an immigrant named Ngolo, described as a young man from East Africa, coming to the U.S. in the hopes of finding a better life. Ngolo's level of assimilation and contact with the locals (vs. other immigrants) was manipulated across scenarios. These descriptions were inspired by materials used by Thomsen et al. (2008).

3.1.2.2. Anti-immigrant sentiments. After reading the scenarios, participants gave their opinion on 12 statements about people like

Ngolo immigrating to the U.S. (from *1 = completely disagree* to *7 = completely agree*). Example items include statements such as: "I would support policies that allow people like Ngolo immigrating to the U.S. (reverse-coded)" and "Immigrants like Ngolo threaten the foundations of our country."

3.1.2.3. Manipulation checks for contact and assimilation. After reading the scenarios and answering the anti-immigrant sentiment questions, participants answered two questions about their perceptions of Ngolo's contact with the locals (e.g., "How frequently do you think Ngolo comes into contact with people who grew up in the U.S. in his everyday life?"), one question about Ngolo's level of assimilation to local traditions and customs ("To what degree do you think Ngolo has adopted American traditions and customs?"), and four questions about Ngolo's level of assimilation to local practices relating to hygiene, food preparation, sexuality and religion (e.g., How similar are Ngolo's food preparation practices to those of people who grew up in the U.S.?).

3.1.2.4. Willingness to persecute immigrants (adapted by Thomsen et al. (2008) from Altemeyer's (1996) Posse Scale). Participants were asked to "imagine that someday in the future the U.S. government decides to outlaw immigrant organizations and requests all citizens to do their best to make sure that the law has a successful effect." Participants then indicated on a scale from *1 (strongly disagree)* to *7 (strongly agree)* how much they agreed with six statements measuring willingness to persecute immigrants (e.g., "I would help hunt down members of immigrant organizations that I knew" and "I would support the execution of immigrant leaders").

3.1.3. Results and discussion

First, we ran an exploratory factor analysis on the anti-immigrant sentiment items. Examination of the scree plot suggested that these sentiments were unidimensional. We retained the three items with the highest factor loadings (ranging from 0.92 to 0.96) and all three reverse-coded items (factor loadings ranging from 0.75 to 0.78), and averaged these six items into a new variable for anti-immigrant sentiments (see OSF for all questions). Items are coded in such a way that higher scores on this variable indicate more negative sentiments toward immigrants.

Next, we examined the reliability of the chosen anti-immigrant sentiment composite and the scales used. The alphas for the variable scales were high: anti-immigrant sentiments ($\alpha = 0.95$), immigrant persecution ($\alpha = 0.93$), contact manipulation check ($\alpha = 0.88$), and assimilation manipulation check ($\alpha = 0.93$). The anti-immigrant sentiment measure and the immigrant persecution measure were correlated at $r = 0.52$, $p < .001$. However, the immigrant persecution measure yielded a floor effect, with 69.1% of participants choosing 2 or lower from a 7-point scale ($M = 2.00$, $SD = 1.45$), compared to 38.9% of participants choosing 2 or lower on the anti-immigrant sentiment measure. The mean of the anti-immigrant sentiment measure was higher than that of immigrant persecution, although still below the composite midpoint ($M = 3.02$, $SD = 1.81$).

We then tested the effect of the manipulations on the manipulation checks (see Table 1 for effect sizes). 2 (contact: high versus low) × 2 (assimilation: high versus low) ANOVAs revealed that the assimilation manipulation most strongly affected the primary manipulation check question about Ngolo's adoption of American norms and customs ($\eta_p^2 = 0.40$). It also affected the secondary manipulation check items regarding food, sexual, religious, and hygiene practices (η_p^2's ranging from 0.12 to 0.26). However, the assimilation manipulation had no effect on perceptions of Ngolo's contact with the locals (η_p^2's ranging from 0.00 to 0.01). In contrast, the contact manipulation strongly affected participants' perceptions of Ngolo's contact with the locals (η_p^2's ranging from 0.45 to 0.46 per question). However, it also influenced perceptions of Ngolo's adoption of local traditions and customs (η_p^2's ranging from 0.09 to 0.21 per question). We speculate that people

perceive immigrants in contact with locals as inevitably adopting some local customs. Nevertheless, the effect of the contact manipulation on perceptions of assimilation was much smaller than the effect of the assimilation manipulation.

We also examined how the assimilation and contact manipulations affected anti-immigrant sentiments and immigrant persecution. These analyses were conducted to aid in power analyses for the main study. We regressed the anti-immigrant sentiment measure described above on (centered) contact and assimilation and their interaction term. Both contact ($b = -0.95$, $p < .0001$) and assimilation ($b = -1.29$, $p < .0001$) manipulations affected anti-immigrant sentiments, whereas their interaction did not ($b = 0.42$, $p = .41$) (total model $R^2 = 0.21$). These results suggest that people had more positive perceptions of immigrants like Ngolo both when he was portrayed as being in contact with the locals and when he was portrayed as trying to assimilate to local traditions and customs. We also regressed the immigrant persecution measure on (centered) contact and assimilation and their interaction term. Neither contact ($b = -0.15$, $p = .51$), nor assimilation ($b = -0.31$, $p = .17$), nor their interaction ($b = 0.24$, $p = .60$) affected immigrant persecution.

Given that the contact manipulation, while strongly affecting perceptions of the immigrant's contact with locals as intended, also affected perceptions of the immigrant's assimilation (though to a much smaller degree), we modified the descriptions to better differentiate between assimilation and contact. Specifically, we made the assimilation manipulation more salient by emphasizing the immigrant's assimilation level at the end of the scenarios. We then ran a second pilot study to validate these scenarios, and to examine how the modified scenarios affected participants' perceptions of the immigrant's assimilation and contact.

3.2. Pilot Study 2

3.2.1. Method
3.2.1.1. Participants. Participants were recruited through MTurk and restricted to U.S. citizens above 18 years of age. We recruited 160 participants (62 female, 1 other gender identity), ranging from 19 to 69 years of age ($M = 35$, $SD = 10.6$). Sample size was decided before any data analysis was conducted.

3.2.1.2. Procedure. The procedure and materials of Pilot Study 2 were identical to those of Pilot Study 1, with the exception that the modified

scenarios were used for the manipulation, and the subset of anti-immigrant sentiment items retained after the factor analysis in Pilot Study 1 was used as the dependent measure.

3.2.2. Materials
All materials are described in full detail in the Open Science Framework (OSF) platform (osf.io/tcuap).

3.2.2.1. Manipulation. As in Pilot Study 1, participants read a description of an East-African immigrant named Ngolo, whose levels of contact and assimilation were manipulated. The scenarios were identical to those of Pilot Study 1, with the exception that they concluded by emphasizing Ngolo's level of assimilation.

3.2.2.2. Anti-immigrant sentiments. After reading the scenarios, participants were asked to give their opinion on the six statements chosen in Pilot Study 1 (from *1 = completely disagree* to *7 = completely agree*). Example items include statements such as: "I feel positive about people like Ngolo immigrating to the U.S. (reverse-coded)" and "Immigrants like Ngolo create problems for our society".

3.2.2.3. Manipulation checks for contact and assimilation. The manipulation check questions in this study were identical to those of Pilot Study 1.

3.2.2.4. Willingness to persecute immigrants. The measure was identical to that of Pilot Study 1.

3.2.3. Results and discussion
We first examined the reliability of the scales used. The alphas for the variable scales were high: $\alpha = 0.95$ for anti-immigrant sentiments and $\alpha = 0.95$ for immigrant persecution. Again, the anti-immigrant sentiment measure and the immigrant persecution measure were moderately correlated ($r = 0.47$, $p < .001$). And again, the immigrant persecution measure yielded a floor effect, with 70.1% of participants choosing 2 or lower from a 7-point scale ($M = 1.98$, $SD = 1.48$), compared to 46.3% of participants choosing 2 or lower on the anti-immigrant sentiment measure. Again, the mean of the anti-immigrant sentiment measure was higher, although still below the composite midpoint ($M = 2.61$, $SD = 1.52$).

Next, we tested the effects of the manipulations on the manipulation checks (see Table 1 for effect sizes). 2 × 2 ANOVAs revealed that,

Table 1

Effects (η_p^2) of contact and assimilation manipulations on manipulation check questions in Pilot Studies 1–2 and in the Registered Study. 90% CI's are in parentheses.

	Pilot study 1		Pilot study 2		Registered study	
	Contact	Assimilation	Contact	Assimilation	Contact	Assimilation
Contact questions						
How frequently do you think Ngolo comes into contact with people who grew up in the U.S. in his everyday life?	0.45 (0.35,0.52)	0.00 (0.00,0.03)	0.53 (0.44,0.59)	0.04 (0.01,0.10)	0.42 (0.38,0.45)	0.01 (0.00,0.02)
How much time do you think Ngolo spends in places where people who grew up in the U.S. spend their time?	0.46 (0.36,0.53)	0.01 (0.00,0.06)	0.50 (0.41,0.57)	0.04 (0.00,0.09)	0.36 (0.32,0.40)	0.03 (0.01,0.05)
Assimilation questions						
To what degree do you think Ngolo has adopted American traditions and customs?	0.21 (0.11,0.29)	0.40 (0.30,0.48)	0.12 (0.05,0.20)	0.48 (0.38,0.54)	0.07 (0.04,0.09)	0.36 (0.32,0.39)
How similar are Ngolo's hygiene practices to those of people who grew up in the U.S.?	0.11 (0.05,0.19)	0.14 (0.07,0.22)	0.06 (0.01,0.12)	0.14 (0.07,0.22)	0.03 (0.01,0.04)	0.09 (0.06,0.12)
How similar are Ngolo's food preparation practices to those of people who grew up in the U.S.?	0.09 (0.03,0.16)	0.12 (0.05,0.20)	0.04 (0.00,0.10)	0.21 (0.12,0.29)	0.03 (0.01,0.04)	0.13 (0.10,0.16)
How similar are Ngolo's attitudes toward sex and relationships to those of people who grew up in the U.S.?	0.12 (0.05,0.20)	0.26 (0.16,0.34)	0.04 (0.00,0.10)	0.15 (0.07,0.23)	0.03 (0.02,0.05)	0.16 (0.13,0.20)
How similar are Ngolo's religious practices to those of people who grew up in the U.S.?	0.10 (0.04,0.18)	0.16 (0.08,0.24)	0.02 (0.00,0.06)	0.16 (0.08,0.24)	0.02 (0.01,0.04)	0.13 (0.10,0.16)

again, the strongest effect of the assimilation manipulation was on the primary manipulation check question about adoption of American norms and customs ($\eta_p^2 = 0.48$). And, again, the assimilation manipulation affected perceptions of Ngolo's religious, hygiene, sexual, and food habits ($\eta_p^2 s$ ranging from 0.14 to 0.21 per question). This time, the assimilation manipulation also had a small effect on the two contact items ($\eta_p^2 's = 0.04$). As in Pilot Study 1, this effect on contact perceptions was much smaller than that of the contact manipulation ($\eta_p^2 's$ equal to 0.50 and 0.53). The contact manipulation again affected perceptions of assimilation, but these effects were again small ($\eta_p^2 's$ ranging from 0.02 to 0.12 per question) – indeed, smaller than those observed in Pilot Study 1. In sum, we interpret these results as suggesting that the contact and assimilation scenarios communicated the intended information about the target immigrant. Hence, we used the scenarios from Pilot Study 2 to test the predictions of the main study.

Finally, we examined the effect of the assimilation and contact manipulations on anti-immigrant sentiments and immigrant persecution. We regressed the anti-immigrant sentiment measure on the (centered) assimilation and contact manipulations and their interaction term. The assimilation manipulation affected anti-immigrant sentiments ($b = -0.97$, $p < .001$), but the contact manipulation did not ($b = 0.10$, $p = .66$), nor did the interaction between contact and assimilation ($b = -0.55$, $p = .23$) (total $R^2 = 0.11$). We also regressed the immigrant persecution measure on (centered) contact and assimilation and their interaction term. As in Pilot Study 1, neither contact ($b = 0.24$, $p = .31$), nor assimilation ($b = -0.09$, $p = .70$), nor their interaction ($b = -0.27$, $p = .56$) affected immigrant persecution.

4. Registered study

The main study followed the same procedures described in Pilot Study 2 – that is, it followed a 2 (assimilation: high versus low) $\times$ 2 (contact: high versus low) design. Because the immigrant persecution measure yielded a floor effect in both pilot studies, we decided to only include the anti-immigrant sentiment measure in our registered study. This measure correlated with the immigrant persecution measure used by Thomsen et al. (2008), suggesting that it is an adept measure to conceptually replicate their findings. The effect of disgust sensitivity on sentiments toward the immigrant and the group that he represents was compared across conditions. Individual differences in traditionalism and social dominance orientation were also measured. Given evidence that sexual strategies account for some (or all) of the relationship between disgust sensitivity and political ideology (Tybur, Inbar, Güler, & Molho, 2015a), political orientation and sociosexual orientation were also measured for exploratory purposes. We report all measures, manipulations and exclusions.

4.1. Method

4.1.1. Participants and power analysis

Participants were recruited through MTurk and restricted to U.S. citizens above 18 years of age. People who took part in the pilot studies were not allowed to take part in the main study. Based on a meta-analysis by Aarøe et al. (2017), we anticipated the main effect of disgust sensitivity to account for 5% of the variance in anti-immigrant sentiments. Further, Pilot Studies 1 and 2 combined suggested that the contact and assimilation manipulations together account for 14% of the variance in anti-immigrant sentiments. Because the interaction between contact and assimilation was not significant in Pilot Studies 1 and 2 ($B's = 0.42$ and -0.55, respectively, $p's = 0.41$ and 0.23, respectively), we did not account for it in the power analysis. Hence, we expected disgust sensitivity, contact, and assimilation to account for 19% of the variance in anti-immigrant sentiments. We aimed to give our study 90%

power to detect a small interaction (an additional 1% of variance accounted for) between disgust sensitivity and the contact manipulation and disgust sensitivity and the assimilation manipulation. A power analysis using G*Power (version 3.1.) with $\alpha = 0.05$, power = 0.90, and an effect size of $f^2 = 0.012$, suggested a sample size of $N = 854$.

4.1.2. Exclusion criteria

Because completion time has been found to be a good identifier of meaningless responding (Leiner, 2013), we used it to determine the exclusion criteria, in combination with attention checks. Based on Pilot Study 2, we expected the median completion time of the main study (with the individual difference measures added) to be 6.30 min. We excluded participants who spent half of the median completion time or less to complete the survey – that is, participants who spent 3.15 min or less. Based on the distribution of completion times in Pilot Study 2, we anticipated excluding 3% of the participants based on this criterion. We also included two pictorial attention checks to screen for people who were not paying attention, as well as any potential bots. Participants viewed two images accompanied with a simple question that required paying attention to the image (see materials) and were excluded if they answered either question incorrectly. We anticipated excluding 2% of participants based on this criterion. Because recent investigations into MTurk data have revealed a problem with low-quality responses originating from "worker farms" that consist of respondents who are not fluent in English (TurkPrime, 2018), we also included a question that requires forming a complete sentence in English (see materials). We excluded respondents who wrote unintelligible or irrelevant answers to this question (e.g., "Nice study"). We anticipated excluding 5% of participants based on this criterion. Therefore, we aimed to recruit a total sample size of $N = 940$ participants.

4.1.3. Procedure

Participants received a link to a Qualtrics survey and provided informed consent. They then read one of the descriptions from Pilot Study 2 and subsequently answered the six anti-immigrant sentiment questions and the seven manipulation check questions used in Pilot Study 2. Participants then answered the attention check aimed to screen for fluency in English. Novel to this study, participants completed the pathogen subscale of the Three Domain Disgust Scale (TDDS; Tybur, Lieberman, & Griskevicius, 2009), the attitude items from the revised Sociosexual Orientation Inventory (SOI; Penke & Asendorpf, 2008), the Social Dominance Orientation scale (SDO7; Ho et al., 2015), and the conventionalism subscale of the Aggression-Submission-Conventionalism scale (ASC; Dunwoody & Funke, 2016). Finally, participants provided demographic information; namely, age, gender, education, income, political alignment, and self-ascribed social class. Participants were then debriefed and compensated.

4.2. Materials

All materials are described in full detail in the Open Science Framework (OSF) platform (osf.io/tcuap). Participants first read one of the four descriptions of the immigrant described in Study 2. They then completed the instruments described below.

4.2.1. Anti-immigrant sentiments

The anti-immigrant sentiment items were identical to those from Pilot Study 2.

4.2.2. Manipulation checks for contact and assimilation

We used the manipulation check items from Pilot Studies 1 and 2.

4.2.3. Attention checks

Participants viewed an image in the beginning of the survey and in the middle of the survey, accompanied with a simple question. One attention check was a picture of bunnies and cats, accompanied with a question: "How many bunnies are in this picture?", and the other one was a picture of an adult panda with cubs, accompanied with a question: "How many baby pandas are in this picture?". Participants who answered incorrectly to either question were excluded. To exclude participants who are not fluent in English, we also included a question after the dependent measure that required forming a complete sentence in English. This question was: "In the previous section, we described a young man named Ngolo, coming from a country in East Africa. We would like you to describe in a sentence or two, what kind of traditions and customs you think people follow in the country where Ngolo comes from."

Before the data were analyzed, the four authors independently read these responses and flagged nonsensical responses or responses communicating a lack of English fluency. Participants whose responses were flagged at least twice were excluded from the analyses. We noted that this question could also be used to explore what kind of traditions and customs people think of when they read about an immigrant who comes from a distant location with foreign norms, though we did not intend to use this information in the current study.

4.2.4. Measures of individual differences

The pathogen subscale of the **Three-Domain Disgust Scale** (TDDS; Tybur et al., 2009) was used to measure disgust sensitivity. Example items from the pathogen subscale include: "Seeing some mold on old leftovers in your refrigerator" and "Shaking hands with a stranger who has sweaty palms". Participants rated the items on a scale from 0 = *Not at all disgusting* to 6 = *Extremely disgusting*.

To measure **traditionalism**, we administered the six-item conventionalism subscale of the Aggression-Submission-Conventionalism scale (ASC; Dunwoody & Funke, 2016). We chose the ASC because its items are more politically and religiously neutral than those of other measures of traditionalism. Higher scores on conventionalism indicate stronger commitment to the norms and traditions of one's society. An example item is: "Traditions are the foundation of a healthy society and should be respected". Participants rated the items on a scale from 1 = *Strongly oppose* to 7 = *Strongly favor*.

To measure **social dominance orientation**, we administered the 16-item Social Dominance Orientation scale (SDO7, Ho et al., 2015). The SDO7 consists of two subscales: SDO-Dominance (SDO-D) and SDO-Egalitarianism (SDO-E). Higher scores on SDO-D indicate a preference for hierarchical relations between groups where high-status groups forcefully oppress lower status groups, whereas higher scores on SDO-E indicate a preference for group inequality that is maintained by subtle hierarchy-enhancing ideologies and social policies (Ho et al., 2015). An example item of SDO-D would be: "Some groups of people are simply inferior to other groups", and an example item of SDO-E would be "Group equality should not be our primary goal". Participants rated the items on a scale from 1 = *Strongly oppose* to 7 = *Strongly favor*. We used the total scale score in the analyses.

Participants also completed the three attitude items from the revised **Sociosexual Orientation Inventory** (SOI; Penke & Asendorpf, 2008). The SOI, originally developed by Simpson and Gangestad (1991), assesses the (un)restrictedness of one's sexual strategy: that is, how open one is to sex outside of a committed relationship. An example item is: "I can imagine myself being comfortable and enjoying 'casual' sex with different partners". Participants rated the items on a scale from 1 = *Strongly disagree* to 9 = *Strongly agree*.

To measure **political orientation**, participants answered two questions: "When it comes to social issues, I consider myself…" and "When it comes to economic issues, I consider myself…" on a scale from 1 = *Very liberal* to 7 = *Very conservative*.

5. Analysis plan

5.1. Manipulation checks

First, we conducted the same manipulation check analyses described in Pilot Studies 1 and 2.

5.2. Primary confirmatory analyses

Zero-order correlations were examined between anti-immigrant sentiments, disgust sensitivity, SDO, and traditionalism. Next, we conducted a moderated regression, in which disgust sensitivity, the contact manipulation (coded as 0 = low contact, 1 = high contact), the assimilation manipulation (coded as 0 = low assimilation, 1 = high assimilation), and all two- and three-way interactions between these three variables were entered as (centered) predictors of anti-immigrant sentiments. We also controlled for gender (coded as female = 1, male = 2), given previously observed gender differences in disgust sensitivity (Druschel & Sherman, 1999; Tybur, Bryan, Lieberman, Hooper, & Merriman, 2011), and potential gender differences in anti-immigrant sentiments. If the interaction terms were significant, we further performed simple slope analyses (i.e., effects of disgust sensitivity within levels of contact and assimilation manipulations; effects of contact and assimilation manipulations at one standard deviation above and below the mean of disgust sensitivity) to explore the nature of the interactions.

The traditional norms account predicts that disgust sensitivity relates more strongly to anti-immigrant sentiments when the immigrant has not assimilated to local norms. Hence, this account predicts a two-way interaction between disgust sensitivity and assimilation, which might be further moderated by contact (i.e., a three-way interaction between disgust sensitivity, assimilation, and contact). The outgroup avoidance account predicts that disgust sensitivity relates more strongly to anti-immigrant sentiments when the immigrant is in contact with the locals, regardless of his assimilation to the local norms. Hence, this account predicts a two-way interaction between disgust sensitivity and contact.

5.3. Auxiliary confirmatory analyses

Next, we aimed to conceptually replicate the finding that traditionalism relates to anti-immigrant sentiments toward an immigrant who is not willing to assimilate to local norms, whereas SDO relates to anti-immigrant sentiments toward an immigrant who *is* willing to assimilate to local norms (Thomsen et al., 2008). We conducted a moderated regression, in which traditionalism, SDO, the assimilation manipulation, and interaction terms (excluding interactions between SDO and traditionalism) were entered as (centered) predictors of anti-immigrant sentiments. If the interaction terms were significant, we further performed simple slope analyses as described above. We expected to find an association between traditionalism and anti-immigrant sentiments toward an immigrant who is *not* willing to assimilate, but not toward an immigrant who is willing to assimilate. In contrast, we expected to find an association between SDO and anti-immigrant sentiments toward an immigrant who *is* willing to assimilate, but not toward an immigrant who is not willing to assimilate. Of course, this was not a direct replication of Thomsen et al. (2008); we used different immigration scenarios, and instead of measuring immigrant persecution, we measured anti-immigrant sentiments with the items described

Table 2
Means, standard deviations, and correlations between the measures.

	Mean	SD	Anti-immigrant	Pathogen DS	SDO	Traditionalism	Gender	Contact	Assimilation
Anti-immigrant	2.40	1.60	0.97						
Pathogen DS	3.78	1.12	**0.09**	0.84					
SDO	2.35	1.35	***0.55***	0.06	0.96				
Traditionalism	4.06	1.32	***0.30***	***0.22***	***0.44***	0.88			
Gender	1.53	0.50	*0.06*	**−0.18**	0.08	−0.07	–		
Contact	0.50	0.50	−0.06	−0.02	−0.02	−0.04	−0.01	–	
Assimilation	0.51	0.50	***−0.29***	−0.00	−0.01	0.01	−0.04	−0.01	–

Note. ***Bold and italics*** = $p < .001$, **bold** = $p < .01$, *italics* = < 0.05. Anti-immigrant = anti-immigrant sentiments (higher values = more negative sentiments). Pathogen DS = pathogen subscale of the TDDS (Tybur et al., 2009), SDO = Social Dominance Orientation (SDO7; Ho et al., 2015), Traditionalism = Conventionalism subscale of the ASC (Dunwoody & Funke, 2016), Gender (female = 1, male = 2), Contact = contact manipulation (higher vales = higher contact), Assimilation = assimilation manipulation (higher values = higher assimilation). Scale alphas are on the diagonal.

earlier. Further, we used updated measures of SDO and RWA. Hence, this replication should be considered conceptual in nature.

6. Results

6.1. Sample and exclusion

Due to a technical error in Qualtrics[1,2,3] the total sample size was larger than initially planned, namely, $N = 1307$ instead of the planned $N = 940$. We excluded 330 participants based on our registered exclusion criteria: 106 based on completion time, 272 based on attention checks, and 140 based on nonsensical or non-fluent responses to the free response question (note that some participants were excluded based on multiple criteria). We also excluded the only participant who reported being neither male nor female, as well as one participant who did not report their gender, since our preregistered analysis plan involved controlling for gender. Hence, the final sample size was $N = 975$. Participants ranged from 18 to 73 years of age ($M = 36.90$ years, $SD = 11.30$; 456 female).

6.2. Manipulation checks

Consistent with both pilot studies, the assimilation manipulation strongly affected perceptions of the immigrant's adoption of American norms and customs ($\eta_p^2 = 0.36$), and it also affected perceptions of the immigrant's religious, hygiene, sexual, and food habits ($\eta_p^2 s$ ranging from 0.09 to 0.16). Its effect on perceptions of contact was much smaller ($\eta_p^2 s$ ranging from 0.01 to 0.03). Conversely, the contact manipulation had only a small influence on the assimilation questions ($\eta_p^2 s$ ranging from 0.02 to 0.07), but it had large effects on perceptions of the immigrant's contact with the locals ($\eta_p^2 s$ ranging from 0.36 to 0.42) (see Table 1 for all effect sizes).

6.3. Primary confirmatory analyses

Consistent with past work (Aarøe et al., 2017), disgust sensitivity was associated with more negative sentiments toward immigrants ($r = 0.09$, $p = .004$; see Table 2 for all bivariate correlations). The

interaction between disgust sensitivity and the contact manipulation did not differ from zero ($b = -0.07$, $t(974) = -0.76$, $p = .45$, $\eta_p^2 < 0.01$; see Fig. 1). Hence, results were not consistent with the outgroup avoidance account. The interaction between disgust sensitivity and the assimilation manipulation was significant, though
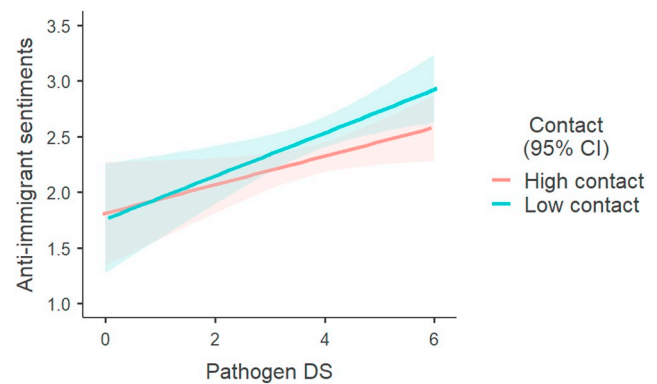

Fig. 1. The relationship between disgust sensitivity and anti-immigrant sentiments at low and high contact. The slope for the low contact condition ($b = 0.19$, $t(974) = 3.07$, $p = .002$) was indistinct from the slope for the high contact condition ($b = 0.13$, $t(974) = 2.14$, $p = .03$). The difference between low and high contact conditions was $b = -0.07$, $t(974) = -1.0$, $p = .32$ at -1 SD below the mean and $b = -0.14$, $t(974) = -0.2.08$, $p = .04$ at $+1$ SD above the mean of disgust sensitivity.
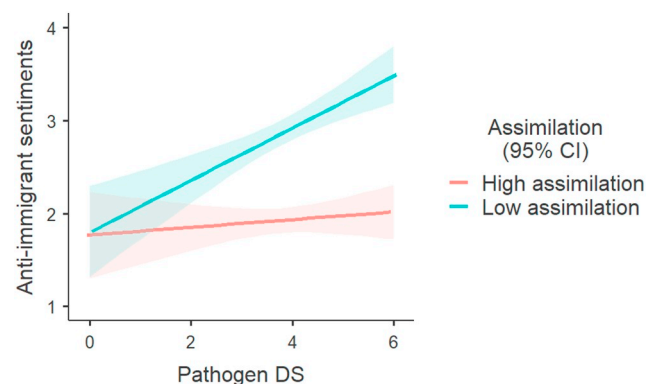

Fig. 2. The relationship between disgust sensitivity and anti-immigrant sentiments at low and high assimilation. The slope for the low assimilation condition ($b = 0.28$, $t(974) = 4.45$, $p < .001$) was steeper than the slope for the high assimilation condition ($b = 0.04$, $t(974) = 0.69$, $p = .49$). The difference between low and high assimilation conditions was $b = -0.34$, $t(974) = -4.95$, $p < .001$ at -1 SD below the mean and $b = -0.61$, $t(974) = -8.88$, $p < .001$ at $+1$ SD above the mean of disgust sensitivity.

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[1] We designed the Qualtrics to automatically approve participants after they completed the survey. The automatic approval failed, and participants had to be manually approved. Participants continued enrolling before others could be approved and, hence, our final sample size exceeded our targeted sample size.

[2] We also analyzed the results according to the original plan; that is, we took the first 940 participants and excluded people based on our exclusion criteria, resulting in $N = 696$ participants. Conclusions pertaining to our key hypotheses were virtually the same on this subsample; see the supplemental materials at osf.io/tcuap for full analyses on the smaller sample.

[3] In our preregistered time plan we aimed to collect the data within one month after In Principle Acceptance. However, due to personal circumstances, the data collection was delayed for a month from the preregistered plan.
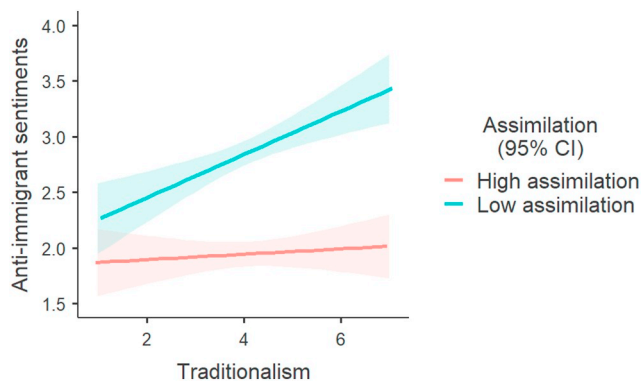
Fig. 3. The relationship between traditionalism and anti-immigrant sentiments at low and high assimilation. The slope for the low assimilation condition ($b = 0.19$, $t(974) = 3.90$, $p < .001$) was steeper than the slope for the high assimilation condition ($b = 0.02$, $t(974) = 0.53$, $p = .60$). The difference between low and high assimilation conditions was $b = -0.35$, $t(974) = -5.79$, $p < .001$ at -1 SD below the mean and $b = -0.57$, $t(974) = -9.54$, $p < .001$ at $+1$ SD above the mean of traditionalism.

Fig. 4. The relationship between SDO and anti-immigrant sentiments at low and high assimilation. The slope for the low assimilation condition ($b = 0.66$, $t(974) = 14.60$, $p < .001$) was indistinct from the slope for the high assimilation condition ($b = 0.54$, $t(974) = 11.20$, $p < .001$). The difference between low and high assimilation conditions was $b = -0.38$, $t(974) = -6.28$, $p < .001$ at -1 SD below the mean and $b = -0.54$, $t(974) = -9.08$, $p < .001$ at $+1$ SD above the mean of SDO.

($b = -0.24$, $t(974) = -2.77$, $p = .006$, $\eta p^2 = 0.01$). Consistent with the traditional norms account, disgust sensitivity related to anti-immigrant sentiments when the immigrant was portrayed as not assimilating to local norms and customs ($b = 0.28$, $t(974) = 4.45$, $p < .001$), but it was unrelated to anti-immigrant sentiments when the immigrant was portrayed as assimilating ($b = 0.04$, $t(974) = 0.69$, $p = .49$; see Fig. 2). Likewise, the simple effect of the assimilation manipulation on anti-immigrant sentiments was stronger for those who scored high on disgust sensitivity ($+1$ SD; $b = -0.61$, $t(974) = -8.88$, $p < .001$) than it was for those who scored low on disgust sensitivity (-1 SD; $b = -0.34$, $t(974) = -4.95$, $p < .001$). The two-way interaction between disgust sensitivity and the assimilation manipulation was not further moderated by the contact manipulation ($b = 0.34$, $t(974) = 1.94$, $p = .052$).

6.4. Auxiliary confirmatory analyses

Next, we aimed to conceptually replicate Thomsen et al.' (2008) finding that traditionalism relates to negative attitudes toward an immigrant who is not willing to assimilate, whereas SDO relates to negative attitudes toward an immigrant who *is* willing to assimilate. Consistent with Thomsen et al. (2008), traditionalism interacted with the assimilation manipulation ($b = -0.17$, $t(974) = -2.51$, $p = .01$, $\eta p^2 = 0.01$), with traditionalism relating to anti-immigrant sentiments when the immigrant was portrayed as not assimilating to local norms ($b = 0.19$, $t(974) = 3.90$, $p < .001$), but not when he was portrayed as assimilating ($b = 0.02$, $t(974) = 0.53$, $p = .60$; see Fig. 3). The effect of the assimilation manipulation was stronger for high traditionalism individuals ($+1$ SD; $b = -0.57$, $t(974) = -9.54$, $p < .001$) than it was for low traditionalism individuals (-1 SD; $b = -0.35$, $t(974) = -5.79$, $p < .001$). In contrast, SDO related to more negative anti-immigrant sentiments in both assimilation conditions; that is, the interaction between SDO and assimilation fell short of significance ($b = -0.12$, $t(974) = -1.88$, $p = .06$, $\eta p^2 < 0.01$, see Fig. 4). This result is not consistent with that reported by Thomsen and colleagues, who found that SDO was unrelated to anti-immigrant sentiments when an immigrant did not assimilate.

7. Discussion

The purpose of this study was to disentangle two accounts that have been proposed to explain the relationship between pathogen-avoidance
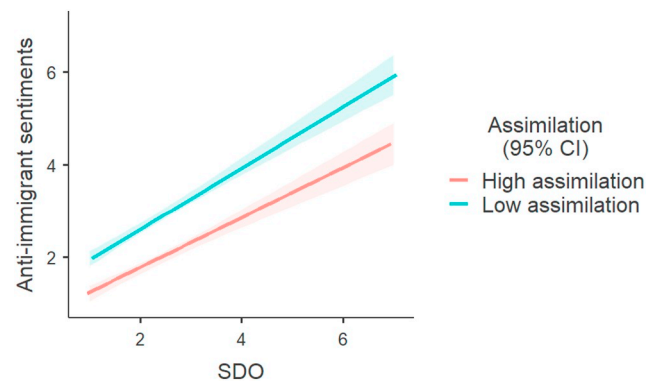
motives (e.g., disgust sensitivity) and opposition to immigration: namely, the *outgroup avoidance account* and the *traditional norms account*. The former posits that disgust sensitivity relates to anti-immigrant sentiments because immigrants are perceived as coming from a different ecology and thus carrying novel pathogens, whereas the latter suggests that this relationship exists because immigrants are perceived as departing from local traditional norms, which putatively evolve partially due to their anti-pathogen properties. Participants read a description of an immigrant whose assimilation to local norms and contact with local people was manipulated across conditions, and they completed a measure of disgust sensitivity. Results were in line with the traditional norms account: disgust sensitivity was related to anti-immigrant sentiments when the immigrant was described as not assimilating to local norms, but not when he was described as assimilating. In contrast, results did not support the outgroup avoidance account: the relationship between disgust sensitivity and anti-immigrant sentiments did not vary depending on the immigrant's described contact with locals. We further discuss the implications of these findings for both accounts below.

7.1. Disgust sensitivity and contact

Contrary to predictions based on the outgroup avoidance account, the immigrant's contact with the locals did not alter the relationship between disgust sensitivity and anti-immigrant sentiments. In fact, anti-immigrant sentiments were lower when the immigrant was portrayed as being in contact with the locals, regardless of the immigrant's level of assimilation. This lack of support for the outgroup avoidance account resonates with recent findings that Americans and Indians are equally comfortable with contact with ethnic ingroup members and ethnic outgroup members, and that individuals are no more uncomfortable with contact with infected outgroup members than with infected ingroup members (Van Leeuwen & Petersen, 2018).

The outgroup avoidance account has also been challenged on conceptual grounds. First, evidence suggests that pathogens evolve traits that aid them in spreading within local host populations rather than novel populations (Hoeksema & Forde, 2008), thus questioning the assumption that humans would have evolved mechanisms to avoid outgroup members on the basis of their different pathogens (de Barra & Curtis, 2012). Second, even if outgroup pathogens are more dangerous, avoiding outgroup members provides limited protection, since other ingroup members that interact with outgroups can be infected by and subsequently transmit those novel pathogens (Fessler, Clark, & Clint,

2015). And, while offering only limited anti-pathogen benefits, avoiding outgroup members would forfeit potential benefits of interacting with people from other groups (e.g., those relating to mates, allies, resources or ideas; Fessler et al., 2015).

7.2. Disgust sensitivity and norms

The traditional norms account rests on the assumption that cultural rules have evolved partially to keep pathogens at bay (Murray et al., 2011). Consistent with this idea, portraying an immigrant as adopting local norms eliminated the relationship between disgust sensitivity and anti-immigrant sentiments. These results contrast with past research conducted in the U.S. suggesting that an immigrant's willingness to learn English or adopt democratic values does not attenuate the relationship between disgust sensitivity and anti-immigrant sentiments (Aarøe et al., 2017). If both findings are correct, then the types of norm departures perceived as posing pathogen threats do not extend to language use or systems of government. Results from the manipulation check questions here suggest that our manipulation affected the extent that participants perceived the immigrant as adapting to local norms relating to food preparation, hygiene, sexuality, and religion – norms that may be especially pertinent to pathogen avoidance. Future experimental work could separately manipulate how an immigrant abides by these (and other) categories of norms and examine how this affects anti-immigrant sentiments.

Notably, at an individual differences level – and consistent with past research (Tybur et al., 2016) – disgust sensitivity was more strongly related to traditionalism ($r = 0.22$, $p < .001$) than it was related to SDO ($r = 0.06$, $p = .08$).[4] That disgust sensitivity relates to valuing traditions rather than supporting barriers between social groups further supports the conclusion that the association between disgust sensitivity and anti-immigrant sentiments reflects resistance to foreign norms, rather than avoidance of contact with outgroups.

7.3. Alternative interpretations

We framed our investigation around outgroup avoidance and traditional norms perspectives, which are the two most prominent hypotheses for explaining the relationship between disgust sensitivity and anti-immigrant sentiments. We note, though, that disgust sensitivity might relate to anti-immigrant sentiments for other reasons. Recent work reports that more pathogen-avoidant individuals are particularly untrusting of people at the periphery of their social circles (e.g., people in one's neighborhood), even if those people are not foreigners (Aarøe, Osmundsen, & Petersen, 2016). This finding has been interpreted as suggesting that high investment in pathogen avoidance discourages cooperation with a broad circle of people regardless of their group membership, because social contact in general increases risk of pathogen transmission (Aarøe et al., 2016). Furthermore, people who are more agreeable are less disgusted by human-related pathogen cues (e.g., touching a stranger's sweaty palm), but not by object-related pathogen cues (e.g., seeing mold in old leftovers in the fridge; Kupfer & Tybur, 2017). This finding suggests that motivations to avoid socially-transmitted pathogens covary with orientations toward harmonious social relationships. Together, this body of work suggests an alternative explanation for our findings. Specifically, a non-assimilating immigrant might be seen as a less valuable exchange partner, either because failing to follow local norms implies low expected social coordination, or because failing to follow local norms implies limited access to resources (cf. Tybur, Inbar, Güler, & Molho, 2015b). If people who are especially invested in avoiding pathogens require higher benefits from social interactions to justify the pathogen risks inherent in social contact, then

we might see differential relationships between disgust sensitivity and sentiments toward assimilating versus non-assimilating immigrants. Future work could aim to examine how disgust sensitivity relates to sentiments toward immigrants varying along their ability to coordinate based on commonly held norms and their ability and likelihood of conferring benefits in exchange relationships.

7.4. Traditionalism, Social Dominance Orientation, and sentiments toward non-assimilating immigrants

We also aimed to conceptually replicate the results of Thomsen et al. (2008) – namely, that Right Wing Authoritarianism (RWA) relates to immigrant persecution when an immigrant is portrayed as *not* assimilating, whereas Social Dominance Orientation (SDO) relates to immigrant persecution when an immigrant is portrayed as assimilating. Our results were partly in line with those of Thomsen and colleagues: traditionalism related to more negative sentiments toward immigrants not assimilating to local norms, but it was unrelated to sentiments toward assimilating immigrants. However, SDO related to negative sentiments toward immigrants, regardless of their assimilation to local norms. The inconsistency between results reported here and those reported by Thomsen and colleagues could arise for multiple reasons. Thomsen and colleagues used their vignettes as primes and measured willingness to persecute immigrants (e.g., "I would support the execution of immigrant leaders"), whereas we asked participants about their sentiments (e.g., "Immigrants like Ngolo create problems for our society") toward people like the immigrant described in the vignettes. Furthermore, our descriptions featured an immigrant from East Africa, whereas Thomsen and colleagues presented participants with a Muslim or Latino immigrant. Further work is needed to better understand which of these design differences contributed to the different conclusions across studies (or, perhaps, whether one of the findings is a false positive or the other a false negative).

7.5. Limitations and future directions

We note a few limitations that can help frame the current results and generate directions for future work. First, MTurk samples are not nationally representative. Although we see no obvious reason why results would not generalize to the U.S. population – and, indeed, MTurk samples are similar to nationally representative ones in terms of many personality and political views (Clifford, Jewell, & Waggoner, 2015; McCredie & Morey, 2018) – future work could replicate these results in a nationally representative sample. Second – and more critically – results might not generalize to non-U.S. populations. Third, we used only one type of manipulation of contact and one type of manipulation of assimilation. Many other methods of manipulating contact and assimilation could be generated, and we cannot say that alternative methods would yield the same results reported here.

Fourth, the current study described an immigrant from East Africa. This design feature was motivated by the presumption that countries in East Africa are perceived by people from the U.S. as distant both culturally and geographically, and thus provide a good test of outgroup avoidance and traditional norms hypotheses. However, as suggested by an anonymous reviewer, the effects of assimilation and contact on anti-immigrant sentiments might vary depending on perceived pathogen density and cultural distance of an immigrant's country of origin. Because the results of our study support the idea that an immigrant's foreign norms – rather than their contact with locals – are perceived as a pathogen threat, we would expect perceived cultural distance to have a stronger effect on anti-immigrant sentiments than perceived geographical distance or pathogen density. For instance, immigrants coming from a location that is culturally distant but less pathogen dense – such as Mongolia or Greenland – could be evaluated more negatively than immigrants coming from a location that is culturally proximate but more pathogen dense – such as Italy (based on the taxonomies of

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[4] $t(972) = 4.84$, $p < .001$; correlations were compared with the R package cocor; Diedenhofen & Musch, 2015.

cultural distance and pathogen density; Murray & Schaller, 2010; Muthukrishna et al., 2018).

8. Conclusion

In line with other research over the past decade, the current findings suggest that disgust sensitivity relates to anti-immigrant sentiments. Manipulating features of an immigrant reveals new information that can elucidate this relationship. Namely, disgust sensitivity related to anti-immigrant sentiments only when an immigrant was described as following foreign – rather than local – norms. Future work can further uncover the features of norm adherence that are especially important to people who are highly motivated to avoid pathogens.

Open practices

The full research plan was preregistered, including all hypotheses, analyses, and materials. The preregistration, materials, and data can be found on osf.io/tcuap.

Acknowledgement

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