

Gendered outgroup prejudice: An evolutionary threat management perspective on anti-immigrant bias

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Abstract

Are male and female immigrants viewed similarly or differently? Consistent with an evolutionary threat management perspective, we suggest that the answer to this question depends upon what types of threats immigrant groups are perceived as posing. In the present study, we compared attitudes toward male and female immigrants from either a violent ecology (e.g., Syria) or a pathogen-rich ecology (e.g., Liberia). We hypothesized that people would have more negative attitudes toward male than female immigrants from a violent ecology, but that attitudes would be similar toward male and female immigrants from a pathogen-rich ecology. Internal meta-analyses of three studies (total $N = 1,488$) were in line with our hypothesis. They showed that attitudes toward male immigrants from a violent ecology were more negative than attitudes toward female immigrants from the same ecology. In contrast, attitudes toward male and female immigrants were similar when those immigrants came from a pathogen-rich ecology. Our findings are consistent with an evolutionary threat management perspective on outgroup prejudice and are aligned with the male warrior hypothesis: Attitudes toward male versus female outgroup members vary with the potential threats these outgroups pose.

Keywords

male warrior hypothesis, outgroup prejudice, pathogen, sex differences, threat management, violence

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In a globalized society, events happening elsewhere in the world can substantially alter our perceptions of strangers. In recent years, perceived threats posed by the rise of ISIS in the Middle East and Ebola outbreaks in sub-Saharan Africa were highly salient in Western societies (Francis, 2014; Gusterson, 2014). These events produced an increase in prejudice toward immigrants and refugees from nations in these areas (Hatton & Nielsen, 2016; Kim, Sherman, & Updegraff, 2016). Further, they might influence

the largely negative sentiments toward immigration seen across many nations. An international poll of

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22 nations showed that 60% of respondents expressed security concerns about immigrants and 40% of respondents preferred closing their national borders entirely (Ipsos, 2016).

Increased prejudice toward immigrants in times of crisis is not an entirely new phenomenon. From intercoalitional aggression in hunter-gatherer societies to racism in modern times, outgroup prejudice appears to be a constant across history and society. Notably, though, outgroups are not homogeneous in the types of prejudice they generate. In facing different kinds of outgroups, individuals may experience varied emotional and behavioral responses. For example, studies with largely White U.S. undergraduate student samples have found that the prejudice toward groups stereotypically associated with threats to safety (e.g., African Americans, illegal immigrants, and Muslims) is motivated mostly by fear, whereas the prejudice toward gay men and obese people is motivated mostly by disgust (Cook, Li, Newell, Cottrell, & Neel, 2018; Cottrell & Neuberg, 2005). Heterogeneity in prejudice might also exist toward immigrants as a function of threat-connoting features, such as their nation of origin, age, and sex. This type of variability is implied by the threat management framework on outgroup prejudice (Neuberg, Kenrick, & Schaller, 2011; Neuberg & Schaller, 2016), which focuses on differences in prejudice against different outgroups and explains how prejudice could be viewed as functionally organized mechanisms to deal with the different threats that outgroups pose.

A Threat Management Perspective on Outgroup Prejudice

A threat management perspective implies that outgroups can pose distinct threats. We focus on two here: violence threats and pathogen threats. In order to minimize the costs of dealing with distinct intergroup threats, individuals have likely evolved functionally distinct psychological mechanisms (Neuberg et al., 2011). Perceptions of violent outgroup threats activate a self-protection

system, which should motivate individuals to (a) pay attention to cues of potential physical harm in other individuals (e.g., angry faces; Fox, Russo, Bowles, & Dutton, 2001), (b) respond to the source of such threats with specific emotions like anger or fear (Cottrell & Neuberg, 2005), (c) show more negative attitudes toward outgroups that are associated with violence (Das, Bushman, Bezemer, Kerkhof, & Vermeulen, 2009), (d) generate behavioral responses—for example, fight or escape—to alleviate threats posed by outgroups (Cesario, Plaks, Hagiwara, Navarrete, & Higgins, 2010).

In contrast, pathogen-avoidance systems should (a) involve the detection of cues of disease risks, (b) generate the emotion of disgust rather than anger or fear, and (c) motivate behavioral avoidance of the source of the pathogen (see Tybur & Lieberman, 2016). Previous research suggests an association between pathogen-avoidance motives and intergroup bias. For example, a few studies have reported that, when contagious diseases are made salient, people report greater ethnocentrism (Navarrete & Fessler, 2006) and greater prejudice against immigrants (Faulkner, Schaller, Park, & Duncan, 2004; Huang, Sedlovskaya, Ackerman, & Bargh, 2011), although at least one set of studies has failed to find such associations (Ji, Tybur, & van Vugt, 2019).

Gendered Outgroup Prejudice

Importantly, we suggest that types of outgroup prejudice are sex-specific, in that outgroup men and women may not be perceived as posing equal levels of threat in all circumstances. Regarding physical violence, intergroup conflicts have historically been perpetrated by male aggressors (Kelly, 2005; Wrangham & Peterson, 1996), because the reproductive payoffs for engaging in risky and aggressive intergroup conflicts are greater for men than women (Buss & Shackelford, 1997; Navarrete, McDonald, Molina, & Sidanius, 2010). Therefore, outgroup men might be perceived as posing a greater violence threat than outgroup women. In line with this argument, the male warrior hypothesis suggests that men have

evolved psychological mechanisms to form aggressive coalitions to further their reproductive success. Consistent with this hypothesis, research has shown that men are more likely to engage in intergroup aggression, both in the real world and in experimental lab conditions (McDonald, Navarrete, & van Vugt, 2012; van Vugt, De Cremer, & Janssen, 2007). In defense against such male coalitional threats, individuals show greater bias against outgroup men than outgroup women, as suggested by experiments using conditioned fear learning (Navarrete et al., 2009), implicit evaluation (Rudman & Goodwin, 2004), and threat-based group categorization tasks (Miller, Maner, & Becker, 2010)—this is referred to as the outgroup male target hypothesis (McDonald et al., 2012).

Intergroup pathogen threats are likely less (if at all) gendered. Women experience more disgust toward pathogen cues than men do (Tybur, Bryan, Lieberman, Caldwell Hooper, & Merriman, 2011), they engage in more hygiene behavior than men do (Stevenson et al., 2009), and they are less susceptible to some pathogens due to the influences of sex hormones and sex chromosome genes (Bernin & Lotter, 2014; Klein & Flanagan, 2016). However, these sex differences are smaller than those in violent aggression, and some infections are actually more severe in women (Ingersoll, 2017; Klein & Flanagan, 2016; Maher, 2013; McClelland & Smith, 2011). Hence, we suggest that attitudes toward male and female outgroup members should be similar if that outgroup is perceived as posing a pathogen threat (i.e., the effect of target sex should be smaller than that for outgroups perceived as posing a violence threat).

The Present Study

To our knowledge, no studies have directly compared how reactions towards outgroups vary as a function of target sex and group associations with either violence or pathogen threats. Thus, in the present study, we investigated how attitudes toward immigrants from a violent ecology versus a pathogen-rich ecology are differentially moderated by

immigrant sex. At the time of conducting our first study,¹ ISIS activities in Syria and Iraq and the Ebola outbreak in West Africa were prominent in the news. Therefore, in Studies 1 and 2 we referred to Syrian immigrants to represent people from a violent ecology and Liberian immigrants to represent people from a pathogen-rich ecology. Because Syrian and Liberian immigrants might be perceived as posing both violence and pathogen threats (and, further, other potential threats)—perhaps partially due to participants' imperfect knowledge regarding these two countries—we provided only threat-relevant information regarding immigrants' ecologies (i.e., we did not provide the name of a country of origin) in Study 3. We hypothesized that people from the host nation perceive immigrants from violent ecologies as being more strongly associated with a violence threat, and thus are more prejudiced toward male immigrants than female immigrants from Syria and the nonlabeled violent ecology. In contrast, local people would perceive immigrants from pathogen-rich ecologies as associated more strongly with pathogen threats and therefore will show no difference in attitudes toward male and female immigrants when they come from Liberia or the nonlabeled pathogen-rich ecology.²

Study 1

The aim of Study 1 was to compare attitudes toward male and female immigrants from different ecologies. We hypothesized that people are more negative toward male immigrants from a violent ecology (i.e., Syria) than toward female immigrants from the same ecology. In contrast, attitudes toward male and female immigrants from a pathogen-rich ecology (Liberia) will not be different.

Method

Participants. Two hundred eighty-one U.S. participants were recruited through Amazon Mechanical Turk and received a small amount of money in return for their participation. Participants who answered either of the two check questions

incorrectly were excluded (origin and sex of immigrants they read in the scenario earlier; $N = 19$). The final sample consisted of 262 participants (99 women, 163 men; $M_{\text{age}} = 31.7$ years, $SD = 9.96$ years).

Participants were randomly assigned to a 2 (sex of immigrants: men vs. women) \times 2 (origin of immigrants: Syria vs. Liberia) between-subjects design.

Procedure and materials. Participants were randomly assigned to read one of four immigration scenarios (one of each sex–origin combination). The scenarios described a group of 100 immigrants, aged 20–24, who wanted to apply for immigration to the United States because of difficult conditions in their home country. The immigrants were described as either men or women and as coming from either the West African nation of Liberia or the Middle Eastern nation of Syria. They were described as having applied for immigration status because of the difficult conditions in their home country. We chose Syria and Liberia because, at the time of data collection, ISIS activities in the Middle East and the Ebola outbreak in West Africa were among the main news items around the world, and they presumably induced concerns about health and safety.

After reading the immigration scenario, participants rated their comfort with the immigrants entering the United States on a 7-point (1 = *very uncomfortable*, 7 = *very comfortable*) scale, and they reported whether, if the decision were up to them, they would allow the immigration (yes or no). We also asked participants how likely the group of immigrants would threaten the health (perceived pathogen threat) and physical safety (perceived violence threat) of United States citizens, using 7-point scales (1 = *not at all likely*, 7 = *very likely*). Finally, we administered two items assessing participants' political attitudes toward social issues and economic issues on a 7-point (1 = *very liberal*, 7 = *very conservative*) scale.

Results and Discussion

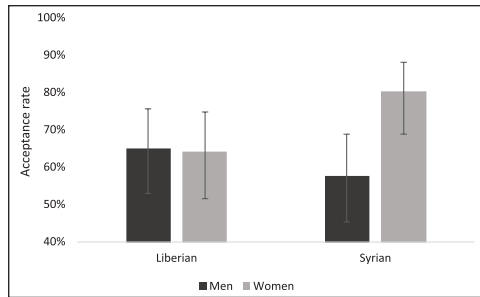
Manipulation check. To test whether participants perceived Syrian immigrants more as a violence

threat and Liberian immigrants more as a pathogen threat, we compared the perceived violence and pathogen threats of immigrants from these two origins. As expected, there was a significant interaction between threat type and origin of immigrants, $F(1, 260) = 96.80, p < .001, \eta_p^2 = .27$. Syrian immigrants ($M = 2.81, SD = 1.48$) were perceived as posing more of a violence threat than Liberian immigrants ($M = 2.29, SD = 1.31$), $F(1, 260) = 8.99, p = .003, d = 0.37$; and Liberian immigrants ($M = 3.67, SD = 1.75$) were perceived as posing a greater pathogen threat than Syrian immigrants ($M = 2.52, SD = 1.32$), $F(1, 260) = 36.00, p < .001, d = 0.76$.

Attitudes towards immigrants. To test the prediction that participants' attitudes toward male and female immigrants differ across immigrant origins, we first conducted a 2 (sex of immigrants: male vs. female) \times 2 (origin of immigrants: Syria vs. Liberia) ANOVA on the continuous measure of attitude toward immigrants (comfort with immigrants). Attitudes toward male versus female immigrants were not moderated by the origin of the immigrants, $F(1, 258) = 2.53, p = .113, \eta_p^2 = .01$. Given that political attitudes account for much of the variance in general attitudes toward immigrants, we next included both social political attitude ($r = -.35$) and economic political attitude ($r = -.23$) as covariates in a subsequent model (see Table S1 in the supplemental material for models with and without covariates). The predicted interaction between immigrant sex and origin was marginally significant, $F(1, 256) = 3.81, p = .052, \eta_p^2 = .02$. Specifically, participants felt less comfort with male Syrian ($M = 4.20, SD = 1.68$) than female Syrian immigrants ($M = 5.45, SD = 1.78$), $F(1, 256) = 18.64, p < .001, d = 0.72$, but there were no sex differences in attitudes toward male ($M = 4.42, SD = 1.87$) and female Liberian immigrants ($M = 4.95, SD = 2.07$), $F(1, 256) = 2.33, p = .128, d = 0.27$.

Next, we regressed immigration decisions on the sex and origin of immigrants in a binary logistic regression analysis (see Table S2 in the supplemental material). The predicted interaction between sex and immigrant origin was significant,

Figure 1. Acceptance rate regressed on origin and sex of immigrants (Study 1).



Note. Error bars represent 95% confidence intervals.

OR = 3.15, $\chi^2(1) = 4.50$, $p = .034$ (see Figure 1), with participants approving less of male Syrian immigrants (57.6%) than female immigrants (80.3%) from Syria, OR = 3.00, Wald $\chi^2(1) = 7.67$, $p = .006$, but approving equally of male (65.2%) and female (64.1%) immigrants from Liberia, OR = 0.95, Wald $\chi^2(1) = 0.02$, $p = .897$. When we added social and economic political attitudes as covariates, the effects of immigrant sex, immigrant origin, and their interaction remained.

Mediation analyses. We included threat perceptions as a manipulation check. Reviewers suggested that we could also use these measures to test whether these threat perceptions (i.e., violence and pathogen threats) mediated effects of immigrant sex on attitudes toward immigrants. We did so by first testing which (if any) threat perceptions mediated the effect of immigrant sex on attitudes toward Syrian immigrants using the PROCESS macro in SPSS (Model 8; Hayes, 2013). Comfort with immigrants was the dependent measure, immigrant sex was the independent variable, perceptions of violence and pathogen threats were mediators, and in order to test the simple mediation effect toward Syrian immigrants, immigrant origin was added as a moderator (see Table S13 in the supplemental material for the full models of the mediation analyses). We found that perceived violence threat (indirect effect = 0.32, 95% CI [0.11, 0.58]), rather than perceived pathogen threat (indirect effect = 0.26,

95% CI [-0.01, 0.54]), indeed mediated the effect of immigrant sex on comfort with Syrian immigrants. However, the direct effect of immigrant sex on comfort with Syrian immigrants remained after controlling for threat perceptions (direct effect = 0.68, 95% CI [0.18, 1.17]).

Results using the dichotomous measure were similar: perceived violence threat (indirect effect = -0.33, 95% CI [-0.69, -0.06]), but not perceived pathogen threat (indirect effect = -0.34, 95% CI [-0.76, 0.01]), mediated the relationship between immigrant sex and decisions for Syrian immigrants. The effect of immigrant sex on decisions about immigration disappeared after controlling for threat perceptions (direct effect = -0.85, 95% CI [-1.77, 0.06]).

In sum, Study 1 investigated the effect of target sex on attitudes toward immigrants from ecologies characterized by violence versus pathogen threats. Consistent with the hypotheses, individuals showed greater anti-immigration bias toward men from the violent ecology than women from the violent ecology, and perceptions of violence threat posed by these immigrants mediated this effect. In contrast, there was no difference in attitudes toward male and female immigrants from the pathogen-rich ecology.

Study 1 had multiple limitations. First, although in the predicted direction, the interaction between sex and origin of immigrants on the continuous attitude measure (i.e., comfort with immigrants) failed to reach the $p < .05$ threshold (though the dichotomous decision did). Second, Study 1 could not adjudicate between at least two explanations for the lack of discrimination between male and female immigrants from a pathogen-rich ecology. One explanation that fits the hypothesis is that individuals show equal negative bias toward male and female immigrants posing a pathogen threat. Alternatively, individuals might simply fail to discriminate between male and female immigrants that do not come from a violent ecology. To test this alternative possibility, we conducted a replication in which we added another immigrant group predicted to be associated with neither violence nor pathogen threats.

Study 2

Study 2 added an immigrant group intended to be perceived as nonthreatening—Lithuanian immigrants—to test whether participants' lack of discrimination based on immigrant sex is specific to immigrants from pathogen-rich ecologies. We also asked participants to rate the perceived economic threat (e.g., taking jobs) that immigrants from these different outgroups pose. We expected that these perceptions would not vary across immigrant groups.

Method

Participants. To determine the targeted sample size for Study 2, we conducted a power analysis using G*Power. Based on the interaction between immigrant sex and origin in Study 1 ($\eta_p^2 = .02$), Study 2 needed 636 participants to achieve 80% power to detect an effect of this magnitude. We first recruited 643 participants. After noticing that 17% ($N = 109$) of the participants failed to answer two simple attention check questions correctly (sex and origin of the immigrants they read in the scenario), we recruited another 200 participants in order to achieve the anticipated sample size.

In total, 844 U.S. participants were recruited from Amazon Mechanical Turk and received a small amount of money in return for their participation. Participants who failed to correctly answer either of the two attention check questions were removed from the sample. Thus, the final sample consisted of 704 participants (311 women, 393 men; $M_{\text{age}} = 35.57$ years, $SD = 11.21$ years).

Procedure and materials. Materials in Study 2 were similar to those of Study 1 with three exceptions. First, to remind participants of the potential threats that the two immigrant groups may pose, we provided threat-related information about Syria and Liberia. Syria was described as a country “where violence is rampant due to the civil war and Islamic terrorism”; and Liberia was described as a country “where infectious disease is rampant, including Ebola, malaria, dengue fever, and the

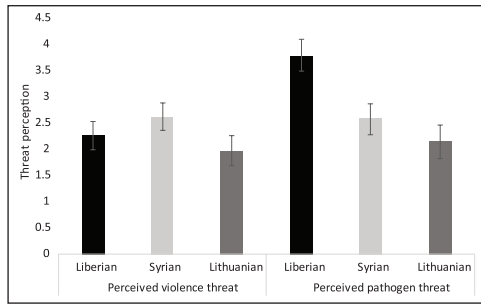
Zika virus.” Second, we added a third immigrant origin—the European nation of Lithuania. In contrast to the scenarios of Syria and Liberia, we did not give any threat-related information of Lithuania (e.g., war, disease), but only provided location information as “the southernmost of Europe’s Baltic states.” Lastly, in addition to asking about perceptions of physical safety (violence) and health (pathogen) threats, we also asked participants to rate how likely the group of immigrants would be to threaten the economic interests of United States citizens (economic threat), as well as perceptions of positive effects that the immigrants would have (1 = *not at all likely*, 7 = *very likely*).

The procedure was similar to that in Study 1. Participants were randomly assigned to read one of six immigration scenarios (one of each sex–origin combination) and then rated their attitudes toward the immigrants, made a yes/no decision to allow immigration, and provided their social and political attitudes and demographic information.

Results and Discussion

Manipulation check. Consistent with Study 1, there was a significant interaction between threat perception and immigrant origin, $F(2, 701) = 118.27$, $p < .001$, $\eta_p^2 = .25$. Syrian immigrants ($M = 3.14$, $SD = 1.93$) were perceived as posing a greater violence threat than Liberian immigrants ($M = 2.66$, $SD = 1.69$), $p = .006$, and Lithuanian immigrants ($M = 2.33$, $SD = 1.41$), $p < .001$. And Liberian immigrants ($M = 4.03$, $SD = 1.93$) were perceived as posing a greater pathogen threat than Syrian immigrants ($M = 2.82$, $SD = 1.82$), $p < .001$, and Lithuanian immigrants ($M = 2.31$, $SD = 1.43$), $p < .001$ (see Figure 2). In addition, Syrian immigrants ($M = 3.27$, $SD = 1.99$) were perceived as posing more of an economic threat than Liberian immigrants ($M = 2.71$, $SD = 1.69$), $p = .02$, but not Lithuanian immigrants ($M = 2.91$, $SD = 1.75$), $p = .091$. Furthermore, Lithuanian immigrants ($M = 4.97$, $SD = 1.46$) were perceived as having more positive effects than Syrian ($M = 4.12$, $SD = 1.80$), $p < .001$, and Liberian immigrants ($M = 4.38$, $SD = 1.64$), $p < .001$. These results suggest that, overall, the

Figure 2. Perceived violence and pathogen threat of immigrants from each origin (Study 2).



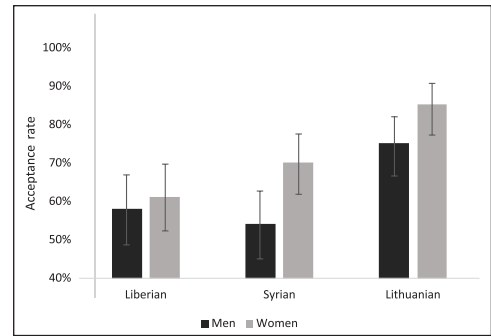
Note. Error bars represent 95% confidence intervals.

control immigrant group was perceived as posing a lower level of threat.

Attitudes toward immigrants. Results of a 2 (sex of immigrants: male vs. female) \times 3 (origin of immigrants: Syria vs. Liberia vs. Lithuania) ANOVA on comfort with the immigrants revealed a nonsignificant interaction between immigrant sex and immigrant origin, $F(1, 698) = 1.79, p = .169, \eta_p^2 = .01$ (see Table S3 in the supplemental material). Next, we added social and political attitudes as covariates. As in Study 1, the interaction between immigrant sex and origin approached but did not reach statistical significance, $F(1, 696) = 2.42, p = .090, \eta_p^2 = .01$. We proceeded to test the predicted simple effects, which showed that participants were less comfortable with Syrian men ($M = 3.95, SD = 1.92$) than Syrian women ($M = 4.98, SD = 1.94$), $F(1, 696) = 22.69, p < .001, d = 0.53$. Similarly, participants felt less comfortable with Lithuanian men ($M = 5.18, SD = 1.65$) than Lithuanian women ($M = 6.06, SD = 1.31$), $F(1, 696) = 18.56, p < .001, d = 0.59$. The effect size for the difference in comfort with Liberian men ($M = 3.96, SD = 2.06$) versus Liberian women ($M = 4.38, SD = 2.08$) was almost identical to that observed in Study 1, and it did not differ from zero, $F(1, 696) = 3.21, p = .074, d = 0.20$.

Regarding binary attitudes ratings, we regressed immigration decisions on the sex and origin of immigrants in a binary logistic regression analysis (see Table S4 in the supplemental material). An omnibus test showed a nonsignificant interaction

Figure 3. Acceptance rate regressed on origin and sex of immigrants (Study 2).



Note. Error bars represent 95% confidence intervals.

between sex and origin of immigrants, $\chi^2(2) = 2.55, p = .279$ (see Figure 3). To test the predicted simple effects, we created two contrasts for origin of immigrants. Contrast 1 was the difference between Syrian and Liberian immigrants, which was used to replicate tests in Study 1. Contrast 2 was the difference between Syrian and Lithuanian immigrants, which compared decisions regarding immigrants from a high-violence ecology and immigrants from a low-threat ecology. Consistent with Study 1, after controlling for social and economic political attitudes, results showed a marginally significant interaction between Contrast 1 and immigrant sex, $OR = 0.49, \chi^2(1) = 2.90, p = .089$. Further inspection showed that there was no difference in approval decisions toward male (58.2%) and female (61.3%) Liberian immigrants, $OR = 1.14, \chi^2(1) = 0.19, p = .661$, who come from a pathogen-rich ecology. For Syrian immigrants, participants approved less of men (54.1%) than women (70.3%), $OR = 2.40, \chi^2(1) = 8.43, p = .004$. Further, the model showed a nonsignificant interaction between Contrast 2 and immigrant sex, $OR = 0.97, \chi^2(1) = 0.003, p = .955$. Similar to the case for Syrian immigrants, participants also approved less toward male (75.2%) than female (85.2%) Lithuanian immigrants, $OR = 2.30, \chi^2(1) = 4.87, p = .027$.

Mediation analyses. Based on the effects of immigrant sex on attitudes toward Syrian and Lithuanian immigrants, next we tested whether these

gendered types of prejudice were mediated by the perceived violence and pathogen threats posed by these two groups. Similar to Study 1, mediation analyses were conducted via the PROCESS macro (Model 8; Hayes, 2013). Considering that Syrian immigrants were also perceived as posing greater economic threat than Liberian immigrants, we also included perceived economic threat as another parallel mediator in the mediation tests (see Table S14 in the supplemental material for the full mediation models). Consistent with Study 1, perceived violence threat did mediate the effect of immigrant sex on comfort with Syrian immigrants (indirect effect = 0.25, 95% CI [0.10, 0.44]). However, it was also mediated by pathogen (indirect effect = 0.21, 95% CI [0.01, 0.42]) and economic threats (indirect effect = 0.10, 95% CI [0.01, 0.22]). Even so, the direct effect of immigrant sex on comfort with Syrian immigrants remained (direct effect = 0.48, 95% CI [0.14, 0.81]). Compared to Syrian immigrants, differences in attitudes toward male versus female Lithuanian immigrants were also mediated by perceived violence threats (indirect effect = 0.16, 95% CI [0.06, 0.30]), but not perceived pathogen (indirect effect = 0.13, 95% CI [-0.02, 0.30]) or economic threats (indirect effect = 0.06, 95% CI [-0.02, 0.16]). The effect of immigrant sex remained after controlling for perceived violence, and pathogen and economic threats (direct effect = 0.52, 95% CI [0.17, 0.87]).

Consistent with the continuous attitude ratings, we found significant mediation effects of perceived violence (indirect effect = -0.39, 95% CI [-0.70, -0.16]) and pathogen (indirect effect = -0.22, 95% CI [-0.48, -0.004]) and economic threats (indirect effect = -0.19, 95% CI [-0.42, -0.02]) on gendered decisions regarding Syrian immigrants. In contrast, gendered decisions regarding Lithuanian immigrants were only mediated by perceived violence (indirect effect = -0.26, 95% CI [-0.49, -0.10]), but not perceived pathogen (indirect effect = -0.14, 95% CI [-0.35, 0.02]) or economic threats (indirect effect = -0.12, 95% CI [-0.31, 0.03]). The effects of immigrant sex on decisions regarding Syrian (direct effect = -0.31, 95% CI [-1.01, 0.40]) and

Lithuanian immigrants (direct effect = -0.25, 95% CI [-1.06, 0.56]) disappeared after controlling for perceived violence, and pathogen and economic threats.

Results of Study 2 were consistent with, and further elaborated, results from Study 1. Attitudes toward male and female immigrants from a pathogen-rich ecology were not different (differences in comfort with male and female Liberian immigrants were marginally significant, however, immigration decisions regarding male and female Liberians were not different). In contrast, for immigrants hailing from either a violent ecology or a low-threat ecology, participants showed greater negativity toward male than female immigrants (differences were significant for both comfort and decision ratings). The gendered outgroup prejudice found in the low-threat ecology further supported the main hypothesis and rejected the alternative hypothesis, which suggested that participants did not discriminate between male and female immigrants from a low-violence ecology. However, similar to Study 1, the predicted interaction failed to reach the threshold for statistical significance.

Study 3

Studies 1 and 2 provided mixed evidence for the hypothesis that individuals evaluate male and female immigrants differently depending on the type of ecology the immigrants came from. However, interaction effects were on either side of the $p < .05$ threshold across the two studies and across the continuous versus dichotomous measures we used. Further, the studies were potentially limited by participants' imperfect knowledge about the target ecologies (i.e., Syria and Liberia). Based on the suggestions from the first round of peer reviews, we preregistered³ and conducted Study 3 to address these limitations. Specifically, we removed the names of the countries of origin and presented only information regarding violence or infectious disease threats in those countries. We also included two individual difference measures—Belief in a Dangerous World Scale (BDW) and Pathogen Disgust

Sensitivity Scale (PDS)—to test the potential influences of chronic concerns about violence and pathogen threats on threat-based gendered outgroup prejudice. These latter measures were included for exploratory purposes at the request of reviewers.

Method

Participants. Based on the interaction between immigrant sex and origin we found in Study 1 ($\eta_p^2 = .02$), we conducted a power analysis using G*Power to determine the targeted sample size in Study 3. We found that Study 3 would need 518 participants to achieve 80% power to detect an effect of this magnitude. Given that participants who failed to answer the attention check questions correctly would be excluded, we pre-registered a target sample of 600 U.S. participants from Amazon Mechanical Turk. In total, 601 participants enrolled in exchange for a small amount of money for their participation.

Following our preregistered data-exclusion plan, participants who failed to correctly answer either of three attention check questions were removed from the sample. Thus, the final sample consisted of 522 participants (192 women, 330 men; $M_{\text{age}} = 37.45$ years, $SD = 11.84$ years).

Procedure and materials. Materials in Study 3 were the same as those for Study 2 with three exceptions. First, we removed the name of the countries that immigrants came from and only provided threat-related information regarding the violence and pathogen-rich ecologies. The violent ecology was described as “a country characterized by high rates of violence. Cars are regularly bombed by terrorists, shootings are rampant, and people are assaulted in the streets.” The pathogen-rich ecology was described as “a country characterized by high rates of infectious disease. People regularly fall ill with contagious diseases such as Ebola, dengue fever, and the Zika virus.” Second, and consistent with Study 1, we only compared attitudes toward violence versus pathogen-rich ecologies. Lastly, we included two individual difference measures—Belief in a

Dangerous World Scale (BDW) and Pathogen Disgust Sensitivity Scale (PDS). BDW ($\alpha = .77$; Altemeyer, 1988) includes 12 items on which participants have to indicate their agreement on 7-point scales (1 = *strongly disagree*, 7 = *strongly agree*). Example items are “Any day now chaos and anarchy could erupt around us” and “There are many dangerous people in our society who will attack someone out of pure meanness, for no reason at all.” PDS ($\alpha = .83$) was assessed using the Three Domain Disgust Scale (TDDS; Tybur, Lieberman, & Griskevicius, 2009), which measures sensitivity to pathogen disgust across seven items on 7-point scales (1 = *not at all disgusting*, 7 = *extremely disgusting*) with items such as “Stepping on dog poop” and “Shaking hands with a stranger who has sweaty palms.”

Participants were randomly assigned to read one of four immigration scenarios (one of each sex–origin combination) and then rated their attitudes (comfort, decision) and threat perceptions toward the immigrants. Next, participants answered three attention check questions. After that, they completed BDW and PDS scales, and rated two items assessing their political attitudes toward social and economic issues. Finally, they provided some demographic information (e.g., sex, age).

Results and Discussion

Manipulation check. Similar to Studies 1 and 2, we found a significant interaction between threat type and immigrant origin, $F(1, 520) = 25.70, p < .001, \eta_p^2 = .05$. Immigrants from a violent ecology ($M = 3.47, SD = 2.00$) were perceived as posing a greater violence threat than were immigrants from a pathogen-rich ecology ($M = 2.96, SD = 1.73$), $F(1, 520) = 9.66, p = .002, d = 0.27$, and immigrants from a pathogen-rich ecology ($M = 4.55, SD = 1.89$) were perceived as posing a greater pathogen threat than were immigrants from a violent ecology ($M = 3.10, SD = 1.83$), $F(1, 260) = 78.88, p < .001, d = 0.78$.

In contrast, differences in perceived economic threat—violent ecology: $M = 3.32, SD = 1.94$; pathogen-rich ecology: $M = 3.18, SD = 1.80$,

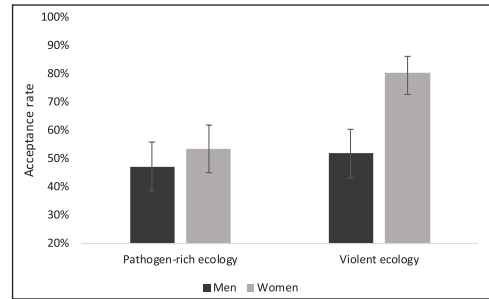
$F(1, 260) = 0.73, p = .394, d = 0.08$ —and positive effects—violent ecology: $M = 4.14, SD = 1.79$; pathogen-rich ecology: $M = 4.02, SD = 1.69$, $F(1, 260) = 0.67, p = .415, d = 0.07$ —between the two immigrant groups were not significant.

Attitudes towards immigrants. Similar to Studies 1 and 2, we first conducted a 2 (sex of immigrants: male vs. female) \times 2 (origin of immigrants: violence vs. pathogen-rich) ANOVA on comfort with the immigrants (see Table S5 in the supplemental material). Consistent with the hypothesis, results revealed a significant interaction between immigrant sex and immigrant origin, $F(1, 518) = 14.02, p < .001, \eta_p^2 = .03$. Simple effect tests showed that, for immigrants from the violence ecology, participants felt less comfortable with male immigrants ($M = 3.50, SD = 1.92$) than with female immigrants ($M = 5.09, SD = 1.82$), $F(1, 518) = 43.19, p < .001, d = 0.86$. However, there was no difference in comfort with male immigrants ($M = 3.57, SD = 1.99$) and female immigrants ($M = 3.88, SD = 2.12$) from a pathogen-rich ecology, $F(1, 518) = 1.53, p = .217, d = 0.15$. Interaction between sex and origin of immigrant remained when we controlled for social and economic political attitudes, $F(1, 516) = 14.98, p < .001, \eta_p^2 = .03$.

We next regressed immigration decisions on immigrant sex and origin in a binary logistic regression analysis (see Table S6 in the supplemental material). Consistent with Study 1, the predicted interaction of immigrant sex and origin was significant, $OR = 2.94, \chi^2(1) = 8.30, p = .004$ (see Figure 4), with participants approving less of male immigrants (52.0%) than female immigrants (80.3%) from a violent ecology, $OR = 3.77, Wald \chi^2(1) = 22.63, p < .001$, but approving equally of male (47.3%) and female (53.5%) immigrants from a pathogen-rich ecology, $OR = 1.28, Wald \chi^2(1) = 0.99, p = .319$. When we added social and economic political attitudes as covariates, the interaction between sex and immigrant origin remained, $OR = 3.28, \chi^2(1) = 8.61, p = .003$.

Mediation analyses. Consistent with Study 1, further mediation analyses showed that perceived

Figure 4. Acceptance rate regressed on origin and sex of immigrants (Study 3).



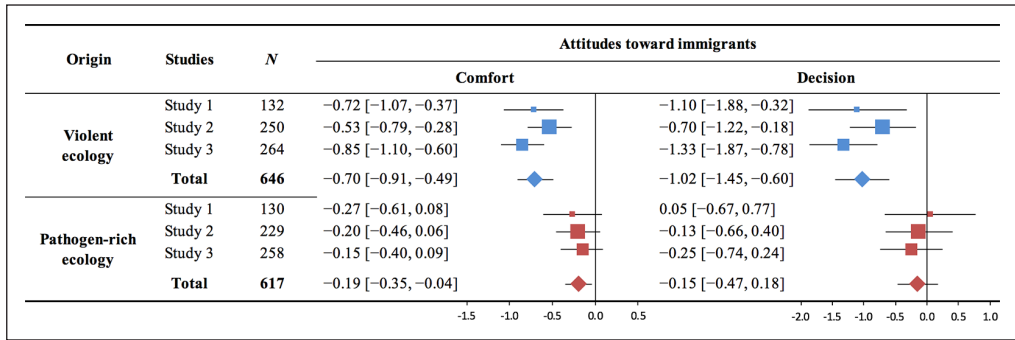
Note. Error bars represent 95% confidence intervals.

violence threat (indirect effect = 0.23, 95% CI [0.09, 0.42]), rather than perceived pathogen threat (indirect effect = 0.10, 95% CI [-0.11, 0.32]), significantly mediated the effect of immigrant sex on comfort with immigrants from a violent ecology (see Table S15 in the supplemental material for the full models). Inconsistent with Study 2, we did not find the mediation effect of perceived economic threat (indirect effect = 0.003, 95% CI [-0.03, 0.04]). The effect of immigrant sex disappeared after controlling for threat perceptions (direct effect = 1.25, 95% CI [-0.88, 1.63]).

Similar to the continuous measure, regarding gendered immigration decisions, perceived violence threat (indirect effect = -0.36, 95% CI [-0.68, -0.14]) rather than perceived pathogen threat (indirect effect = -0.14, 95% CI [-0.46, 0.15]) or perceived economic threat (indirect effect = -0.003, 95% CI [-0.07, 0.05]) significantly mediated the effect of immigrant sex on decisions regarding immigrants from a violent origin (see Table S15 in the supplemental material for the full mediation models). The effect of immigrant sex on decisions regarding immigrants from a violent origin remained after controlling for perceived violence and pathogen threats (direct effect = -1.74, 95% CI [-2.49, -0.99]).

Exploratory analyses. To explore the relationships between individual differences in BDW and PDS on views toward immigrants from different ecologies, we separately added BDW and PDS (both

Figure 5. Meta-analyzed sex effects on attitudes toward immigrants. Separate effects of sex of immigrants on comfort with and decision regarding immigrants from violent and pathogen-rich ecologies.



Note. A negative value indicates greater prejudice toward male compared to female immigrants.

centered) to the models. In the first two models, we regressed (a) comfort with the immigrants and (b) immigration decisions on BDW, immigrant sex, immigrant origin, and their interactions. Regarding comfort with immigrants, in addition to the effects of origin and immigrant sex, results only revealed a significant main effect of BDW, which negatively related to comfort with the immigrants, $\beta = -.62$, $t(514) = -7.21$, $p < .001$. However, BDW did not moderate effects of immigrant sex, immigrant origin, or their interactions ($ps > .10$). Similarly, there was also only a significant main effect of BDW on immigration decisions, $OR = 2.25$, $\chi^2(1) = 13.62$, $p < .001$. Participants with higher BDW were more likely to reject immigration than those with lower BDW. Effects remained the same in the two models when controlling for social and economic political attitudes.

In the next two models, we used PDS instead of BDW to predict comfort with and decisions regarding immigrants. Similar to BDW, PDS predicted less comfort, $\beta = -.25$, $t(514) = -3.32$, $p = .001$, and more rejection of immigrants, $OR = 1.48$, $\chi^2(1) = 6.52$, $p = .011$, but it did not moderate the effects of immigrant sex, immigrant origin, or their interactions.

In sum, consistent with Studies 1 and 2, results of Study 3 provided further support for the hypothesis that attitudes toward male immigrants are more negative than those toward female

immigrants from a violent ecology, which was mediated through perceived violence threat from immigrants from this ecology. In contrast, there were not target sex differences on attitudes toward immigrants from a pathogen-rich ecology. In addition, although chronic concerns about violence and pathogen threats predict prejudice toward immigrants, prejudice was moderated by sex of immigrants in the predicted direction.

Meta-Analysis

Although we interpreted results of the individual studies as generally in line with the hypotheses, p values inconsistently crossed the .05 threshold for statistical significance. Following recommendations based on “the new statistics” (Cumming, 2014; Goh, Hall, & Rosenthal, 2016), we conducted internal, random effects meta-analyses to better estimate the overall effect sizes of immigrant sex on attitudes toward (both comfort with and decision regarding) immigrants using the metafor package for R (Viechtbauer, 2010). We separately meta-analyzed effects of immigrant sex when the immigrant group comes from violent ecologies (Syria in Studies 1 and 2, and a nonlabeled violent ecology in Study 3) versus pathogen-rich ecologies (Liberia in Studies 1 and 2, and a nonlabeled pathogen-rich ecology in Study 3). See Figure 5 for the meta-analyzed effects.

Regarding immigrants from a violent ecology, participants reported less comfort with male relative to female immigrants, $d = -0.70$, 95% CI [-0.91, -0.49], and they were more likely to reject male immigrants, with an observed logit of -1.02 , 95% CI [-1.45, -0.60]. In contrast, participants were slightly less comfortable with male immigrants from pathogen-rich ecologies, $d = -0.19$, 95% CI [-0.35, -0.04], but they were not more likely to reject male immigrants from such ecologies; observed logit of -0.15 , 95% CI [-0.47, 0.18].

General Discussion

Across three studies, we tested a gendered outgroup prejudice hypothesis derived from an evolutionary threat management perspective. We investigated whether people show differential gender-based prejudice toward immigrants from a violent ecology versus a pathogen-rich ecology. Largely consistent with the hypotheses, results of internal meta-analyses showed that attitudes toward male and female immigrants were similar when those immigrants came from a pathogen-rich ecology. In contrast, people's attitudes toward male immigrants from a violent ecology were more negative than attitudes toward female immigrants from the same ecology. Further, differences in attitudes toward male and female Syrian immigrants were mediated by perceived violence threat from these immigrants.

Results were in line with predictions derived from the threat management perspective on outgroup prejudice, which posits that different outgroups pose different threats, and as a consequence, individuals may have evolved functionally distinct responses to deal with these threats (Neuberg et al., 2011). Consistent with this argument, we found that people evaluated male and female immigrants differently, based on the perceived threats posed by the immigrants. The present study also supports and extends the male warrior hypothesis, which suggests that males, more so than females, have been historically involved in costly coalitional aggression and thus people—irrespective of their own sex—should

possess tailored, different reactions to male versus female outgroup members when these outgroups are associated with violence threat (see also the outgroup male target hypothesis; McDonald et al., 2012). Consistent with this argument, we found that when violence threat was salient (i.e., immigrants from a violent ecology), people showed greater negativity toward male immigrants than female immigrants. Yet when outgroups pose a potential pathogen threat, both men and women are potential carriers of pathogens, and therefore evoke similar prejudice.

Notably, we found that when no specific threat was salient (i.e., immigrants from a low-violence or low-pathogen ecology), participants also showed greater prejudice toward male immigrants than female immigrants. This possibly suggests an increased prejudice against outgroup males in general. Outgroup men might be perceived as more threatening than outgroup women, even when no extra information is provided, perhaps because of the historical dangers that outgroup men have posed (see male warrior hypothesis). This finding also fits with error management theory, which claims that sometimes less costly errors are made to avoid more costly errors (Haselton & Buss, 2000). In this case, mistakenly assuming that all outgroup men are threatening would be less costly than assuming a stranger outgroup man poses no threat. Future study is needed to further understand the general negativity towards male outgroup members.

As an exploratory test, the present study also investigated the potential influences of individual differences in threat perceptions on gendered outgroup prejudice. We found that participants with higher BDW showed greater negativity toward immigrants, regardless of the sex and origin of immigrants. At first blush, these results appear inconsistent with those reported by Cook et al. (2018), who found an association between high BDW and greater prejudice toward groups associated with threat to safety than toward groups associated with other threats. However, Cook and colleagues referred to illegal immigrants (along with other groups) to represent safety threats. Hence, the main effect of BDW observed here is

consistent with these previous findings; the lack of an interaction indicates that BDW does not differentially relate to attitudes toward immigrants from different ecological origins. In addition, we found that PDS also positively correlated with greater negativity toward immigrants from both violent and pathogen-rich ecologies, which suggests that PDS might relate to a general immigrant avoidance, regardless of which potential threat those immigrants may pose. The finding is consistent with Sparks, Fessler, Chan, Ashokkumar, and Holbrook (2018), who suggest an association between disgust propensity and general risk avoidance. However, no research has directly compared effects of PDS on attitudes toward immigrants who pose different threats, though one recent study found that PDS has a stronger effect on attitudes toward immigrants from a pathogen-rich ecology than those from an origin-unspecified ecology (Ji et al., 2019). Future study is needed for further exploration.

Although our main hypothesis concerned comparisons of attitudes toward male versus female immigrants from different ecologies, our hypotheses also imply that the interaction between immigrant sex and ecological origin is driven by attitudes toward female immigrants. That is, given that women and men pose roughly equal pathogen threats, but women pose much less of a violence threat, we should see a larger effect of ecological origin for female immigrants than for male immigrants. Results of an additional meta-analysis showed that, across three studies, both attitudes toward ($d = -0.41$, 95% CI $[-0.63, -0.18]$) and decisions regarding (with an observed logit of -0.83 , 95% CI $[-1.37, -0.28]$) female immigrants from a pathogen-rich ecology were more negative than those for women from a violent ecology. In contrast, there were no differences in attitudes toward ($d = 0.04$, 95% CI $[-0.11, 0.20]$) and decisions regarding (with an observed logit of 0.05 , 95% CI $[-0.27, 0.37]$) male immigrants from a violent versus a pathogen-rich ecology.

In the social psychological literature, different theories explain outgroup prejudice from different angles. For instance, social identity

theory suggests that people have a tendency to categorize themselves in certain groups. Discriminating against outgroups helps to protect group status and personal and collective self-esteem (Tajfel, 1970). In contrast, a terror management perspective posits that prejudice against outgroups is motivated by the fear of own mortality (Das et al., 2009; Greenberg, Pyszczynski, & Solomon, 1986). However, these perspectives do not pay enough attention to the fact that outgroups are not homogeneous. Outgroup members differ in sex, age, and the ecology they originate from. In the present study, we found tailored reactions towards different members of the same outgroups, which might be better explained by perspectives from evolutionary psychology (threat management and male warrior/outgroup male target hypotheses) than alternative theories.

Before closing, we will briefly outline limitations of our research and prospects for future research. First, we did not include effect of participant sex on threat-based gendered outgroup prejudice in the present study. Based on the male warrior hypothesis, we predicted that people, irrespective of their own sex, would be biased against violent outgroup men in particular (because, as potential warriors, they were a recurrent threat in ancestral environments). We conducted exploratory analyses including participant sex in the models (see pages 4–7 in the supplemental material). We did not find significant moderation effects of participant sex (yet only found a significant main effect of participant sex in Study 1). That said, even if men and women have similar attitudes toward immigrants from threatening ecologies, the mechanisms underlying these attitudes might vary across sexes. For men, negativity toward violent outgroup men might be driven by intrasexual aggression (Navarrete et al., 2010). For women, similar negativity might arise from mechanisms for avoiding sexual coercion (McDonald, Asher, Kerr, & Navarrete, 2011). Future studies could further compare these gendered mechanisms under outgroup prejudice. In addition, economic threats—in the sense of outgroup members using up scarce resources—are

likely to also influence people's attitude toward immigrants. Previous research has suggested that perceived economic scarcity induces greater racial biases (Krosch & Amodio, 2014; Rodeheffer, Hill, & Lord, 2012). In the present findings, results of Study 2 showed that, in addition to violence threat, Syrian immigrants were also perceived as posing the greatest economic threat among the three immigrant groups, and these economic threat perceptions mediated the effect of immigrant sex on attitudes toward Syrian immigrants. Though the mediation effect of perceived economic threat was absent in Study 3, future studies could further investigate if and how economic-threat-based outgroup prejudice differs from prejudice based on other threats. Furthermore, future research could test the effect of the spread of immigrants across a host nation, which may also differentially influence attitudes toward outgroups with different potential threats. Specifically, immigrants perceived as posing a violence threat might be perceived as even more threatening when grouped in the same location. In contrast, grouping potentially infectious immigrants in the same place may reduce the possibility for potential disease transmission.

In sum, the present research supports an evolutionary threat management perspective on outgroup prejudice and is in line with predictions from the male warrior hypothesis—attitudes toward male and female outgroups differentially vary depending on the potential threats the outgroup poses. People showed greater prejudice toward outgroup men from a violent ecology than outgroup women from the same ecology. In contrast, attitudes toward outgroup men and women from a pathogen-rich ecology were the same. The findings could be beneficial for policymaking about immigration issues with a view, for example, on how to best to manage potential anti-immigration biases among the public.

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Supplemental material

Supplemental material for this article is available online.

Notes

1. Study 1 was conducted on November 20, 2014; Study 2 was conducted on June 21–26, 2018; and Study 3 was conducted on May 10–14, 2019.
2. In addition to Studies 1, 2, and 3, we also investigated the effect of immigrant age (young vs. old) on gendered outgroup prejudice against refugees in two additional studies, which are described on page 8 of the supplemental material.
3. Preregistration information is available at <https://osf.io/j78cp/>

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