

Original Article

Extending the Behavioral Immune System to Political Psychology: Are Political Conservatism and Disgust Sensitivity Really Related?

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Abstract: Previous research suggests that several individual and cultural level attitudes, cognitions, and societal structures may have evolved to mitigate the pathogen threats posed by intergroup interactions. It has been suggested that these anti-pathogen defenses are at the root of conservative political ideology. Here, we test a hypothesis that political conservatism functions as a pathogen-avoidance strategy. Across three studies, we consistently find no relationship between sensitivity to pathogen disgust and multiple measures of political conservatism. These results are contrasted with theoretical perspectives suggesting a relationship between conservatism and pathogen avoidance, and with previous findings of a relationship between conservatism and disgust sensitivity.

Keywords: Disgust, pathogen avoidance, political attitudes, individual differences

Introduction

Evolutionary biologists believe that the deleterious effects of pathogens have engendered a competitive “arms race” between parasites and their hosts. This arms race is thought to have contributed to the evolution of sexual recombination, a metabolically expensive immune system, and complex psychological and behavioral adaptations (Hamilton, Axelrod, and Tanese, 1990; Van Valen, 1973). Researchers have recently investigated how selection pressures imposed by pathogens influence important aspects of human behavior and psychology, thereby extending our somatic immune responses to include a “behavioral immune system” (Schaller and Duncan, 2007). Potential components

of this system include emotions, attitudes, and cognitions consistent with a prophylactic behavioral strategy to guard against illness, including biases in mate preferences and mating systems (Fessler and Navarrete, 2004; Gangestad and Buss, 1993; Lieberman, Tooby, and Cosmides, 2007; Low, 1990), biased attention, memory, and attitudes toward individuals with physical deformities (Ackerman, Becker, Mortensen, Sasaki, Neuberg, and Kenrick, 2009; Kurzban and Leary, 2001; Park, Faulkner, and Schaller, 2003; Park, Schaller, and Crandall, 2007), as well as cross-cultural variation in food preferences and taboos (Fessler and Navarrete, 2003; Sherman and Billing, 1999), religious diversity (Fincher and Thornhill, 2008), and systems of government (Thornhill, Fincher, and Aran, 2009).

A substantial portion of this research has focused on the pathogen threats posed by intergroup interactions (Faulkner, Schaller, Park, and Duncan, 2004; Fincher, Thornhill, Murray, and Schaller, 2008; Letendre, Fincher, and Thornhill, in press; Navarrete and Fessler, 2006; Navarrete, Fessler, and Eng, 2007; Schaller and Murray, 2008; Thornhill et al., 2009). Crushing epidemics (e.g., smallpox brought to the Western Hemisphere by Europeans) underscore the infectious disease consequences of group interactions. Although pathogens virulent enough to decimate entire populations likely require inter-population geographic boundaries with population densities characteristic of recently developed, state-level human societies to emerge (see Dobson and Carper, 1996; Ewald, 1994), even small-scale traditional societies appear to be adapted to resist different parasites than neighboring groups (Black, 1975), and less virulent pathogens may have shaped psychological adaptation.

Given the plausible infection threat posed by intergroup interactions, recurrent intergroup contact over evolutionary time may have given rise to a selective advantage for facultative shifts in attitudes, cognitions, and behaviors relevant to reducing pathogen threats posed by intergroup interactions. Multiple lines of research support this hypothesis. For example, Navarrete and Fessler (2006) found that individuals who perceived themselves at greater risk for infectious disease expressed more ethnocentric attitudes. Similarly, after experimentally manipulating disease-salience in undergraduate participants, Faulkner et al. (2004) observed increased negativity toward foreigners. In a natural experiment, Navarrete et al. (2007) reported that pregnant women are more ethnocentric than non-pregnant women, particularly in the first trimester of pregnancy, when they are especially vulnerable to pathogens.

Similar logic has motivated further investigations of group (cultural) level constructs. Fincher et al. (2008) suggested that, because collectivism is associated with strong intergroup distinctions and wariness toward outgroups, societies living in ecologies with greater pathogen stress (and, hence, greater potential for group differences in parasite immunity, and greater probability for parasite transmission) should be more collectivist. Letendre et al. (in press) argued that parasite stress simultaneously causes increased ethnocentrism and impedes economic development, which synergistically cause high rates of intrastate conflict (e.g., civil war). Fincher and Thornhill (2008) posited that religious diversity within societies (i.e., the number of religions within a nation) functions to encourage ingroup interactions and discourage potentially infectious intergroup interactions. Finally, noting conceptual overlap between several of the aforementioned

traits and institutions, Thornhill et al. (2009) suggested that a variety of traits described as markers of nations' autocracy-democracy are locally adapted to combat threats presented by infectious disease. Using indices of infectious disease composed of parasites that are directly transmittable between humans (e.g., leprosy), transmitted by non-human vectors (e.g., malaria, trypanosomiasis), and infectious to humans directly (e.g., shistosomiasis), each of these investigations has supported the posited hypotheses (see Thornhill, Fincher, Murray, and Schaller, 2010, for a summary).

Given that cross-cultural variability on parasite indices is related to cross-cultural variation in the above mentioned traits, Thornhill et al. (2009) suggest that pathogen threats not only motivate intergroup bias and ethnocentrism, but a broader conservative political ideology: "the liberalization of the values of people, or the opposite shift in their values to increased conservatism, is explicable by psychological changes in attitudes and associated behavior toward ingroups and outgroups that are caused proximately by individuals' perception of vulnerability to infectious disease" (p. 123). This perspective is relevant to a topic of great interest to contemporary social scientists: the nature and function of political ideology.

Disease Avoidance and Political Ideology

Although research concerning relationships between pathogen threats and constructs relevant to political attitudes (e.g., individualism/collectivism, openness to experience) has largely concerned cross-cultural variation in regional parasite loads and society-level differences in relevant constructs, the underlying theoretical argument offers a powerful lens through which to investigate individual differences in political ideology. Specifically, it generates a "behavioral immune system hypothesis" of individual differences in political ideology. That is, that conservative political ideology emerges from psychological systems designed to reduce pathogen threats. In this paper, we explore this hypothesis across three studies by examining the putative link between conservatism and the emotion disgust, which is believed to be a powerful psychological motivator of disease avoidance.

Disgust and disease avoidance

Recent work on disease-avoidance strongly suggests that disgust is an emotional system that evolved, in part, to neutralize pathogen threats (Curtis and Biran, 2001; Fessler, Eng, and Navarrete, 2005; Navarrete and Fessler, 2006; Oaten, Stevenson, and Case, 2009; Tybur, Lieberman, and Griskevicius, 2009). Disgust demonstrates several design features consistent with this function: it is elicited by cues for infectious content (Curtis, Aunger, and Rabie, 2004; Oum, Lieberman, and Aylward, in press); it is associated with a facial expression that may function to prevent oral ingestion (or to expel objects from the mouth; Ekman and Friesen, 1975; Rozin and Fallon, 1987); and it motivates behavioral avoidance of pathogen threats (Deacon and Olatunji, 2007; Rozin and Fallon, 1987).

Individuals differ in the degree to which they experience disgust toward pathogen cues (Haidt, McCauley, and Rozin, 1994; Tybur et al., 2009). Researchers in multiple areas have capitalized on this variation to test hypotheses concerning individual differences in

investment in pathogen-avoidance behaviors. For example, DeBruine, Jones, Tybur, Lieberman, and Griskevicius (2010) hypothesized that women's investment in avoiding infectious disease should relate to their preference for men's facial masculinity, which may advertise immunocompetence (see Rhodes, Chan, Zebrowitz, and Simmons, 2003; Thornhill and Gangestad, 2006). They tested and supported this hypothesis by demonstrating that women's sensitivity to pathogen disgust positively covaried with preferences for men's facial masculinity. Similarly, Fessler et al. (2005) posited that, given suppressed immune function during the first trimester of pregnancy, women should be more invested in avoiding pathogen threats during this period, and thus be more sensitive to disgust. They indeed found greater sensitivity to disgust during the first trimester of pregnancy compared to the second and third trimesters.

Given that (a) disgust is a motivator of pathogen avoidance and (b) current theory and research links sensitivity to disgust with investment in avoiding pathogens, it follows that individual differences in disgust sensitivity can be used to test the hypothesis that political conservatism is motivated by pathogen avoidance. Thus, a straightforward prediction falls out of the behavioral immune system hypothesis of political conservatism: If conservative ideology functions to mitigate infection threats, then conservatives should be more avoidant of and disgusted by pathogen cues, relative to liberals.

There is some evidence consistent with this prediction. Across three studies, Inbar, Pizarro, and Bloom (2009) found that conservatives score higher than liberals on derivations of the Disgust Scale (Haidt et al., 1994), a widely used measure of individual differences in disgust sensitivity. However, results from this study should be interpreted with caution for two primary reasons. First, the Disgust Scale is substantially composed of items that do not straightforwardly relate the pathogen avoidance. Half of the items on the measure do not directly relate to disgust, but instead tap the endorsement of symbolic fear or anxiety (e.g., "I would go out of my way to avoid walking through a graveyard") or attitudes regarding the etiquette of third-parties (e.g., "It bothers me to hear someone clear a throat full of mucous"). Second, the Disgust Scale conflates some theoretically and empirically distinct domains of disgust and ignores others. Although disgust is clearly related to pathogen avoidance, it also operates across domains related to sexuality and morality. These three disgust domains are characterized by different patterns of individual differences, which demonstrate convergent and discriminant validity with other theoretically relevant constructs (Tybur et al., 2009). Measures derived from the Disgust Scale developed by Haidt et al. (1994) – and results from two of three studies reported by Inbar et al. (2009) – collapse over pathogen-relevant and sexually-relevant items, and they do not consider moral disgust. Thus, findings reported by Inbar et al. may indeed reflect a relation between pathogen avoidance and conservatism, or they may reflect relations between conservatism and sexual disgust, or conservatism and other constructs measured within the Disgust Scale. Regardless, the conclusion derived by Inbar et al. – that conservatives are more disgust sensitive than liberals – should be further explored using a measure with clearer construct validity and breadth. In the current studies, we aim to test the behavioral immune system hypothesis of political conservatism using a measure of disgust sensitivity that has been empirically validated and possesses a multidimensional structure relevant to a more textured understanding of the evolutionary psychology of

disgust.

In sum, we have two main goals. First, we seek to test the behavioral immune system hypothesis of political conservatism by examining the relationship between sensitivity to pathogen disgust and political conservatism. In doing so, we test for relationships between disgust sensitivity and several measures of conservatism, including a single-item measure of political ideology (Study 1), a multi-item composite of political ideology (Studies 2 and 3), several measures conceptually related to political conservatism (Study 3), and a latent variable estimated using covariance between multiple measures (Study 3). Second, we seek to clarify previous research describing empirical associations between disgust sensitivity and political conservatism. To this end, we use the Three Domain Disgust Scale (Tybur et al., 2009) and the most recent version of the Disgust Scale developed by Haidt et al. (1994).

Study 1

In our initial study, we tested for a direct relationship between political conservatism and disgust sensitivity as measured by the Three Domain Disgust Scale (TDDS; Tybur et al., 2009). The TDDS measures disgust sensitivity separately for pathogen, sexual and moral domains. Each item on the scale directly addresses disgust, and the measure has a clear, theoretically derived and empirically confirmed factor structure, thus eliminating two shortcomings of the original Disgust Scale (Haidt et al., 1994). Including the TDDS not only allows us to test for a relationship between political conservatism and sensitivity to pathogen disgust, but also between conservatism and sensitivity to sexual and moral disgust.

Materials and Methods

Three hundred sixty-three undergraduate students (194 women; mean age = 20.0 years) from Michigan State University participated in exchange for course credit.

We assessed political ideology using a single, Likert-type scale item, where participants described themselves by selecting a number from 1 (very liberal) to 7 (very conservative). This simple, face-valid measure of political ideology has been shown to relate to a number of implicit and explicit preferences relevant to the current investigation, including order versus chaos, conforming versus rebelliousness, tradition versus progress, and traditional values versus feminism (Jost, Nosek, and Gosling, 2008). The sample mean (3.46) differed from the scale midpoint in the liberal direction, $t(362) = 6.66$, $p < .01$, $d = .35$. Nevertheless, the sample demonstrated variability in ideology: 46% of participants selected a “non-liberal” ideology (i.e., neutral through very conservative), and 28% of participants selected “conservative” or “very conservative.”

Participants also completed the TDDS, which asks participants to rate the degree to which they find various concepts disgusting on a 0 (Not at all disgusting) to 6 (Extremely disgusting) Likert-type scale. Examples of pathogen items include “Stepping on dog poop” and “Seeing some mold on old leftovers in your refrigerator”; examples of sexual items include “Finding out that someone you don’t like has sexual fantasies about you” and

“Bringing someone you just met back to your room to have sex”; and examples of moral items include “Deceiving a friend” and “Forging someone’s signature on a legal document.” The seven items in each domain were unit-weighted to form three composites with good internal reliability (Cronbach’s $\alpha = .83, .85, \text{ and } .87$, respectively). Consistent with previous findings (Tybur et al., 2009), the composites were modestly correlated, with the pathogen factor correlating with the sexual and moral factors (r ’s = .44 and .25, respectively), and the sexual and moral factors correlating with each other ($r = .35$).

Results

Bivariate correlations revealed that conservatism was weakly related to sensitivity to sexual disgust, $r = .13, p < .05$, but not moral disgust, $r = .07, p = .17$, or pathogen disgust, $r = .03, p = .64$. None of these correlations differed significantly between the sexes at the $p < .05$ level. Given that sensitivity to these disgust domains shares some statistical and theoretical overlap (Tybur et al., 2009), conservatism was then regressed simultaneously on sensitivity to pathogen, sexual, and moral disgust, and participant sex and age (see Table 1). Interpretation was unchanged: sensitivity to sexual disgust was uniquely related to conservatism, $\beta = .22, p < .01$, whereas sensitivity to moral and pathogen disgust were unrelated (p ’s $> .64$).

Table 1. Bivariate correlations and standardized multiple regression coefficients predicting political conservatism

Predictor	r	p	β	p
Participant Sex	0.02	0.64	0.17	< .05
Participant Age	-0.17	< .01	-0.16	< .01
Sensitivity to Pathogen Disgust	0.03	0.64	-0.02	0.78
Sensitivity to Sexual Disgust	0.13	< .05	0.22	< .01
Sensitivity to Moral Disgust	0.07	0.17	0.03	0.64

Note: Coefficients significant at the $p < .05$ level are in bold font.

Discussion

An initial test for a relationship between sensitivity to pathogen disgust and conservative ideology did not yield support for the behavioral immune system hypothesis of political conservatism. Further, results were not consistent with conservatives being generally more sensitive to disgust than liberals (Inbar et al., 2009). Instead, conservatives appear to be more sensitive specifically to sexual disgust, but not pathogen or moral disgust.

Although we found no evidence to suggest that conservatives are more invested in pathogen avoidance than liberals, our null results may have related to an inadequate assessment of conservatism. Single-item measures of conservatism have reasonable validity (Carney, Jost, Gosling, and Potter, 2008; Jost, 2006; Jost et al., 2008), but they have limited breadth, and resulting inferences are especially vulnerable to measurement error. Thus, in Study 2, we assessed ideology in a manner consistent with that used by Inbar et al. (2009) and others (see Knight, 1999, for a summary of measures of ideology). Finally, in addition to again testing for relationships between political conservatism and the TDDS, we also included the Disgust Scale-Revised (DS-R; Olatunji et al., 2007), the most recent published version of the measure used to assess disgust sensitivity by Inbar et al.

Study 2

Materials and Methods

Two hundred fifty-three undergraduate students (211 women; mean age = 20.4 years) from the University of New Mexico participated in the study, which consisted of an online survey, in exchange for course credit.

Participants indicated their agreement with four statements intended to measure political conservatism on a 1 (strongly disagree) to 5 (strongly agree) Likert-type scale: I consider myself to be politically liberal; I consider myself to be politically conservative; I often identify with the policies of the Democratic Party; I often identify with the policies of the Republican Party. Items for which higher scores indicate liberal affiliation were reverse scored, and a unit-weighted composite with good internal reliability was computed (Cronbach's $\alpha = .88$). As in Study 1, the mean ideology score (2.72) was more liberal than the scale midpoint, $t(252) = 4.25, p < .01, d = .27$. Again, there was abundant variation in ideology, with 46% of the sample at the scale midpoint or more conservative, and 33% more conservative than the scale midpoint.

Participants completed the TDDS, which again demonstrated good internal reliability for the pathogen, sexual, and moral factors (Cronbach's $\alpha = .83, .85, \text{ and } .87$, respectively), and the DS-R (Olatunji et al., 2007; $\alpha = .87$). Thirteen items on the DS-R ask participants their endorsement of statements (measured on a 0 – strongly disagree to 6 – strongly agree scale), and 12 items ask participants to indicate how disgusted they are by various concepts (measured on a 0 – not at all disgusted to 6 – extremely disgusted scale). Including the DS-R allows for a replication of results reported by Inbar et al. (2009), who report a relationship between conservatism and disgust sensitivity using a version of this measure¹. Additionally, although the DS-R factors may not reflect investment in pathogen

¹ Inbar et al. (2009) used an unpublished eight-item short form of the Disgust Scale (Haidt et al., 1994) for two of three studies. In the third study, they used Disgust Scale Version 2, an unpublished revision of the original scale that nevertheless has very similar item content as the original. The Disgust Scale-Revised (Olatunji et al., 2007) differs from the original Disgust Scale in that it removed seven of the original 32 items that possessed the greatest measurement problems.

avoidance as straightforwardly as the TDDS pathogen factor does, versions of this measure have been used to assess investment in pathogen avoidance in the past (Fessler et al., 2005; Navarrete and Fessler, 2006). Indeed, in this sample, the DS-R correlated strongly with the pathogen factor of the TDDS, $r = .65, p < .001$, but less strongly with the sexual factor, $r = .38, p < .001$, and moral factor, $r = .12, p = .06$

Results

We first examined bivariate relationships between the four-item ideology composite and the TDDS and DS-R. Results were consistent with those in Study 1. Sensitivity to pathogen disgust was not related to conservatism, $r = .07, p = .26$, nor was the DS-R, $r = .06, p = .32$. Sensitivity to sexual disgust was again related to conservatism, $r = .21, p < .001$, as was sensitivity to moral disgust, $r = .15, p < .05$. None of the correlations between conservatism and disgust sensitivity differed between the sexes at the $p < .05$ level. Next, we regressed conservatism on participant sex, age, the DS-R, and the three TDDS factors. Again, sensitivity to sexual disgust was related to conservatism, $\beta = .27, p < .01$, (see Table 2), as was participant sex, $\beta = .18, p < .05$, with men reporting greater conservatism.

Table 2. Bivariate correlations and standardized multiple regression coefficients predicting political conservatism

Predictor	<i>r</i>	<i>p</i>	β	<i>p</i>
Participant Sex	0.02	0.71	0.18	<.05
Participant Age	-0.09	0.15	-0.06	0.34
Sensitivity to Pathogen Disgust	0.07	0.25	-0.01	0.88
Sensitivity to Sexual Disgust	0.21	<.001	0.27	<.01
Sensitivity to Moral Disgust	0.15	<.05	0.08	0.25
Disgust Scale-Revised	0.06	0.32	-0.03	0.76

Note: Coefficients significant at the $p < .05$ level are in bold font.

Discussion

In Study 2, we built upon Study 1 by using a broader measure of conservatism and including another measure of disgust sensitivity, the DS-R. We still found no relationship between pathogen avoidance and political conservatism. Further, we again demonstrated that political conservatism does not appear to relate to general disgust sensitivity, but is associated with disgust toward specifically sexual concepts. Despite improving the breadth of our conservatism measure, it is possible that our measures in Studies 1 and 2 were inadequate to test the behavioral immune system hypothesis of political conservatism. In

Study 3, we attempted to replicate results from Studies 1 and 2 using additional, theoretically relevant measures of conservatism.

Study 3

Although it has been implied that general liberal versus conservative values are related to investment in pathogen avoidance (e.g., Thornhill et al., 2009), it is possible that self-reports of conservative ideology or political party affiliation do not adequately capture aspects of ideology influenced by pathogen avoidance. In Study 3, we included the measure of conservatism used in Study 2 and three additional measures that are conceptually related to conservatism (cf. Jost et al., 2003): Right Wing Authoritarianism (RWA; Altemeyer, 1988), Social Dominance Orientation (SDO; Pratto, Sidanius, Stallworth, and Malle, 1994), and Religious Fundamentalism (RF; Altemeyer and Hunsberger, 1992). RWA measures submission to authority, condemnation of deviants, and adherence to traditions (e.g., “The ‘old-fashioned ways’ and the ‘old-fashioned values’ still show the best way to live”; “Our country desperately needs a mighty leader who will do what has to be done to destroy the radical new ways that are ruining us”); SDO measures acceptance of group inequality and divisions between groups (e.g., “Inferior groups should stay in their place”; “Increased social equality should be one of our primary goals”); and RF measures the belief that a single religion contains essential, fundamental truths (e.g., “The fundamentals of God’s religion should never be tampered with or compromised with others’ beliefs”; “God has given humanity a complete, unyielding guide to happiness and salvation, which must be totally followed”).

Materials and Methods

Four hundred seventy-five undergraduate students (322 women; mean age = 19.9 years) from the University of New Mexico participated in the study in groups of five to 20 in exchange for course credit.

We included the same measure of political conservatism used in Study 2, which again formed a composite with good internal reliability (Cronbach’s $\alpha = .88$). Participants also completed RWA, SDO, and RF (Cronbach’s $\alpha = .93, .88,$ and $.95,$ respectively) scales, as well as the TDDS, which again demonstrated good internal reliability for pathogen, sexual, and moral domains (Cronbach’s $\alpha = .77, .85,$ and $.82,$ respectively).

Results

Replicating results from Study 2, the four-item composite of political conservatism was related to sensitivity to sexual disgust, $r = .24, p < .001,$ and sensitivity to moral disgust, $r = .11, p < .05,$ but unrelated to sensitivity to pathogen disgust, $r = .03, p = .51.$ Again, when all three disgust factors and participant sex and age were regressed on the four-item political conservatism composite, only sensitivity to sexual disgust was significantly related to conservatism, $\beta = .35, p < .001.$ Conservatism was not related to sensitivity to pathogen disgust, $\beta = -.08, p = .08,$ or sensitivity to moral disgust, $\beta = .05,$

$p = .31$.

All three disgust domains shared significant bivariate relationships with RWA and RF. However, when sex, age, and the three disgust domains were simultaneously regressed on RWA and RF, only sensitivity to sexual disgust remained as a unique predictor ($\beta = .51, p < .001$, and $\beta = .48, p < .001$, respectively). Only sensitivity to pathogen disgust shared a significant, though weak, bivariate relationship with SDO, $r = .10, p < .05$. When sex, age, and the three disgust domains were simultaneously regressed on SDO, both sensitivity to pathogen disgust and sexual disgust emerged as significant predictors ($\beta = .10, p < .05$, and $\beta = .16, p < .01$, respectively). Notably, sensitivity to moral disgust was *negatively* related to SDO, $\beta = -.10, p < .05$, suggesting that individuals who are more disgusted by anti-social behaviors such as lying, cheating, and stealing are less in favor of group inequality and intergroup domination. Regression coefficients are provided in Table 3.

Table 3. Standardized multiple regression coefficients predicting political conservatism

Predictor	Conservatism	RF	RWA	SDO	C (Latent)
Participant Sex	0.19	0.16	0.25	0.23	0.26
Participant Age	-0.08	0.00	0.00	-0.01	0.00
Sensitivity to Pathogen Disgust	-0.08	0.06	0.04	0.10	0.04
Sensitivity to Sexual Disgust	0.35	0.48	0.51	0.16	0.53
Sensitivity to Moral Disgust	0.05	0.00	-0.01	-0.10	0.01

Note: Coefficients significant at the $p < .05$ level are in bold font.

Each of the four dependent measures included in Study 3 are moderately to strongly correlated, with Pearson coefficients (r) ranging from .34 (between SDO and RF) to .72 (between RWA and RF). Conceivably, such covariances reflect an underlying dimension common to each variable. This underlying dimension may most adequately capture conservatism as a theoretical construct, and may thus offer the best test of the behavioral immune system hypothesis of political conservatism.

A latent variable “C” was estimated using EQS 6.1 (Bentler, 1995). RWA, RF, SDO, and conservatism were each constrained to load on the C latent variable. Paths from sensitivity to pathogen disgust, sexual disgust, moral disgust, and participant sex and age were fit to the latent variable, and exogenous variables were allowed to covary. Essentially, this was a multiple regression analysis in which C was regressed on the three disgust factors, sex, and age. Model fit statistics were adequate when judged by CFI and SRMR, but were suboptimal based on the RMSEA statistic, $\chi^2(17, n = 475) = 89.49, p < .001$, CFI = .94, SRMR = .05, RMSEA = .10. A Lagrange Multiplier (LM) test, which identifies model modifications that would improve fit, indicated that additional paths from sensitivity to sexual disgust to RF and SDO would significantly improve fit, as would a covariance between error terms for SDO and conservatism. Fit was improved after adding these

parameters, $\chi^2(14, n = 475) = 36.72, p < .001, CFI = .98, SRMR = .03, RMSEA = .06$. Although estimates based on the latter model are reported below, the standardized paths from exogenous variables to the latent variable did not vary by more than .01 between the two models. C did not relate to sensitivity to pathogen disgust, $\beta = .04, p = .41$, or sensitivity to moral disgust, $\beta = .00, p = .99$. Of the predictors, only sensitivity to sexual disgust, $\beta = .54, p < .001$, and participant gender (i.e., being male), $\beta = .26, p < .001$, were significantly related to C.

Discussion

In our third study, we again found no relationship between sensitivity to pathogen disgust and political conservatism. We also failed to detect any unique relationship between sensitivity to pathogen disgust and Right Wing Authoritarianism or Religious Fundamentalism, and we found that, while sensitivity to pathogen disgust was significantly related to Social Dominance Orientation, it accounted for only 1% of the variance in SDO. Most importantly, we found that sensitivity to pathogen disgust was unrelated to a latent variable estimated with the covariance between conservatism, RWA, RF, and SDO.

General Discussion

Pathogens are typically invisible to the naked eye, yet they have the ability to impact selection in powerful, often non-intuitive ways. By critically examining routes through which pathogens are transmitted, researchers have hypothesized that a variety of psychological and cultural traits and institutions (e.g., xenophobia, collectivism, intergroup conflict, religious diversity) have developed to neutralize pathogen threats (Faulkner et al., 2004; Fincher and Thornhill, 2008; Fincher et al., 2008; Letendre et al., in press; Navarrete and Fessler, 2006; Navarrete, et al., 2007; Schaller and Murray, 2008; Thornhill et al., 2009). Noting conceptual overlap between phenomena such as collectivism and religion, Thornhill et al. (2009) suggest that general ideological conservatism may function to neutralize pathogen threats. We extended this hypothesis and applied it to individual differences in political conservatism. Using sensitivity to pathogen disgust as a measure of investment in pathogen avoidance, we repeatedly found no evidence to support this hypothesis. Results were consistent across samples and measures of conservatism. In Study 1, we measured conservatism with a single-item measure. In Study 2, we used a four-item composite of identifications with political parties and ideologies. In Study 3, we used the same composite, as well as Right Wing Authoritarianism, Social Dominance Orientation, and Religious Fundamentalism, and a latent variable estimated using covariances between each of these measures. These results cast doubt on the hypothesis that individual differences in conservatism directly relate to pathogen avoidance, and they clarify the relationship between disgust sensitivity and conservatism as individual differences traits.

Political conservatism and disease avoidance

At face value, our results are inconsistent with the hypothesis that political ideology is related to pathogen avoidance. Multiple possibilities could explain the discordance

between our empirical findings and the hypothesis offered by Thornhill et al. (2009). First, sensitivity to pathogen disgust may be a poor measure of investment in pathogen avoidance. We find this unlikely based on empirical results suggesting that disgust sensitivity is a valid measure of investment in pathogen avoidance (e.g., DeBruine et al., 2010; Fessler et al., 2005). Second, our measures of political ideology may have inadequately assessed political conservatism. Again, we find this unlikely. Measures employed across these three studies are face valid, have been shown to relate to the attitudes and cognitions that, under this theoretical framework, may function to mitigate pathogen threats (e.g., preferences for ingroups, preferences for tradition and stability; see Jost et al., 2008), and were varied enough to capture a breadth of aspects of conservatism. Third, it is possible that previous arguments that pathogen avoidance motivates a) traits such as individualism and collectivism, openness to experience, and openness to sex in the absence of a committed relationship, and b) societal level characteristics such as religious diversity and violent conflict are indeed correct, but that these constructs are sufficiently independent of political ideology that pathogen avoidance does not relate to conservatism.

It is also possible that covariation between society-level parasite stress (which, presumably, motivates greater psychological investment in pathogen avoidance) and constructs such as religious diversity (Fincher and Thornhill, 2008), democratization and gender egalitarianism (Thornhill et al., 2009), and individualism/collectivism (Fincher et al., 2008) apply at a cultural level, but not an individual level. Extrapolating relationships found at one level (e.g., political states) to another (e.g., individuals) is often invalid (see Pearl, 2000). For example, Gelman, Shor, Bafumi, and Park (2007) contrast a state-level analysis of the effect of income on voting in United States presidential elections with an individual-level analysis. Whereas U.S. states with higher average individual incomes are more likely to vote for Democrats, individuals with higher incomes are more likely to vote for Republicans. Hence, in some cases, using aggregate data as the unit of analysis can lead to conclusions that are inconsistent with, or even opposite from individual-level phenomena. Presumably, the proposed processes leading to the development of state-level conservatism would need to first operate at an individual level. In this investigation, we failed to find such an individual-level effect. It would be fruitful for future investigations to examine individual-level effects consistent with past group-level analyses. If individual-level effects are not present, then incongruences between individual and state-level analyses should be addressed and incorporated into theories of how pathogen avoidance impacts individual and group psychology and behavior.

Naturally, these results should not be interpreted as suggesting that motivations to avoid pathogens do not have important effects on social and personality processes. Experimentally induced pathogen salience has been shown to increase negativity toward ethnic outgroups (Faulkner et al., 2004), decrease extraversion (Mortensen, Becker, Ackerman, Neuberg, and Kenrick, 2010), and modulate attention to and memory for disfigured faces (Ackerman et al., 2009), and presumably stable individual differences in motivations to avoid pathogens relate to a number of psychological constructs (see Duncan, Schaller, and Park, 2009, for a review). However, consistent null results in the current studies suggest that sensitivity to pathogen disgust – and presumably motivation to avoid pathogens – is not related to individual differences in political ideology in this population.

Disgust sensitivity and political conservatism

In addition to testing the behavioral immune system hypothesis of political conservatism, we also sought to replicate, clarify, and extend findings reported by Inbar et al. (2009) that political conservatism is related to disgust sensitivity. Results from three studies were clear and consistent: sensitivity to sexual disgust, but not pathogen or moral disgust, is related to conservatism. This was somewhat surprising given the measure of disgust sensitivity used by Inbar et al. was derived from the Disgust Scale (Haidt et al., 1994), which is more strongly related to sensitivity to pathogen disgust than sexual disgust (Tybur et al., 2009). However, we also failed to replicate the previous finding of a relationship between disgust sensitivity and conservatism using the Disgust Scale-Revised (Olatunji et al., 2007), which has virtually identical item content to the measures used by Inbar et al. (though, notably, the DS-R does not include sexual items, whereas the versions of the Disgust Scale used in two of three data sets reported by Inbar et al. do). It is unclear why our results diverge from those reported by Inbar et al., especially given that we used large samples from populations similar to those used in two data sets reported by Inbar et al. (i.e., undergraduate college students). It is possible that the population correlation between conservatism and the Disgust Scale (or DS-R) is non-zero and positive, but it is small enough that we failed to detect it in our sample.

However, even if a relationship exists between conservatism and the Disgust Scale (Haidt et al., 1994) or one of its variants (e.g., the DS-R), it is not clear how such a relationship would inform a behavioral immune system hypothesis of political conservatism. The construct measured by the Disgust Scale is substantially defined by the degree to which individuals are bothered or upset by acts that may not directly relate to disgust or pathogen avoidance (e.g., “I would go out of my way to avoid walking through a graveyard”) and disgust responses toward acts that are not obviously related to pathogen avoidance (e.g., “If you see someone put ketchup on vanilla ice cream and eat it”). Future investigations comparing the Disgust Scale to conservatism (and other constructs) should critically consider the degree to which the measure is influenced by general tendencies to be upset or bothered (e.g., neuroticism) in addition to disgust sensitivity and investment in pathogen avoidance.

The pattern of relationships between political conservatism and sensitivity to pathogen, sexual, and moral disgust inform the validity of each construct. For example, although political conservatives are ostensibly more concerned with morality than liberals – or at least voters report weighing morality heavier after voting for conservative political candidates (Haidt and Graham, 2007) – conservatism was unrelated to the moral domain of the TDDS. At first glance, this may seem counterintuitive. However, the moral domain of the TDDS is defined by disgust reported toward anti-social violations related to dishonesty and reciprocity. According to the moral foundations theory offered by Haidt and Graham (see also Graham, Haidt, and Nosek, 2009), liberals and conservatives both weigh honesty and reciprocity when making moral judgments. Conservatives and liberals diverge in other moral domains (e.g., respect for hierarchy, spirituality), which do not appear to be measured by the TDDS. Our results may offer partial support to moral foundations theory, and, at minimum, they demonstrate that political ideology is not related to disgust toward violations of social norms basic to group living and cooperation.

The relationship between political conservatism and sensitivity to sexual disgust was consistent across studies and measures of conservatism, and it suggests that conservatives are not generally more sensitive to disgust than liberals, but are specifically more sensitive to sexual disgust. These findings compliment a developing body of research suggesting links between sexuality and constructs relevant to political ideology. For example, Weeden, Cohen, and Kenrick (2008) demonstrate that sexual behavior covaries with religious attendance, and they argue that religious participation partially functions to promote monogamous, reproductive sex in this population (i.e., the U.S.). Subsequent experimental evidence supports this hypothesis: People report greater religiosity after being primed with attractive intrasexual competitors, who might threaten investments in monogamy (Li, Cohen, Weeden, and Kenrick, 2010). Similarly, Kurzban, Dukes, and Weeden (2010) demonstrate that several measures of sexual restrictiveness (including sensitivity to sexual disgust) covary with negativity toward some politically relevant attitudes (e.g., attitudes toward recreational drugs). Conceivably, individuals invested in a monogamous, restricted sexual strategy are opposed to recreational drugs because some psychostimulants can encourage sexual promiscuity. Although religious attitudes and attitudes toward recreational drugs are not perfectly related to political ideology, these patterns mirror associations between political conservatism and negativity toward non-normative sexual practices and sex in general (Haidt and Hersh, 2001; Jost et al., 2008). If U.S. political conservatives tend to favor a monogamous, biparentally investing reproductive strategy, then their greater sensitivity to sexual disgust may reflect a greater investment in regulating, avoiding, and condemning sexual behaviors that impose especially large costs given their reproductive strategies.

It is notable that religious and political attitudes and affiliations are strongly related in the United States, where these studies were conducted. Indeed, additional analyses of data presented in Study 3 suggest that, when regressed upon gender, age, political conservatism, and Religious Fundamentalism, sensitivity to sexual disgust is related to Religious Fundamentalism ($\beta = .35, p < .01$), but not conservatism ($\beta = .07, p = .11$). Such results echo findings that religiosity influences attitudes toward sexual behaviors and groups associated with specific sexual behavior (e.g., homosexuals) independent of other variables associated with conservatism (Laythe, Finkel, Bringle, and Kirkpatrick, 2002). Hence, it may be the relationship between religiosity and sexual disgust that warrants future research rather than the relationship between political ideology and sexual disgust (cf. Weeden et al., 2008). Future cross-cultural investigations into the relationships between sensitivity to sexual disgust, religiosity, and political conservatism can fruitfully inform the nature of all three constructs.

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References

- Ackerman, J. M., Becker, D. V., Mortensen, C. R., Sasaki, T., Neuberg, S. L., and Kenrick, D. T. (2009). A pox on the mind: Disjunction of attention and memory in the processing of physical disfigurement. *Journal of Experimental Social Psychology*, *45*, 478–485.
- Altemeyer, B. (1988). *Enemies of freedom: Understanding right-wing authoritarianism*. San Francisco, CA: Jossey-Bass.
- Altemeyer, B., and Hunsberger, B. (1992). Authoritarianism, religious fundamentalism, quest, and prejudice. *The International Journal for the Psychology of Religion*, *2*, 113-133.
- Bentler, P. M. (1995). *EQS structural equations program manual*. Encino, CA: Multivariate Software.
- Black, F. L. (1975). Infectious diseases in primitive societies. *Science*, *187*, 515–518.
- Carney, D. R., Jost, J. T., Gosling, S. D., and Potter, J. (2008). The secret lives of liberals and conservatives: Personality profiles, interaction styles, and the things they leave behind. *Political Psychology*, *29*, 807-840.
- Curtis, V., Aunger, R., and Rabie, T. (2004). Evidence that disgust evolved to protect from risk of disease. *Proceedings of the Royal Society of London B*, *271*, S131–S133.
- Curtis, V., and Biran, A. (2001). Dirt, disgust, and disease: Is hygiene in our genes? *Perspectives in Biology and Medicine*, *44*, 17-31.
- Deacon, B. J., and Olatunji, B. O. (2007). Specificity of disgust sensitivity in the prediction of behavioral avoidance in contamination fear. *Behaviour Research and Therapy*, *45*, 2110-2120.
- DeBruine, L. M., Jones, B. C., Tybur, J. M., Lieberman, D., and Griskevicius, V. (2010). Women's preferences for masculinity in male faces are predicted by pathogen disgust, but not sexual or moral disgust. *Evolution and Human Behavior*, *31*, 69-74.
- Dobson, A. P., and Carper, E. R. (1996). Infectious diseases and human population history. *Bioscience*, *42*, 115-126.
- Duncan, L. A., Schaller, M., and Park, J. H. (2009). Perceived vulnerability to disease: Development and validation of a 15-item self-report measure. *Personality and Individual Differences*, *47*, 541-546.
- Ekman, P., and Friesen, W. V. (1975). *Unmasking the face: A guide to recognizing emotions from facial clues*. Englewood Cliffs, NJ: Prentice Hall.
- Ewald, P. W. (1994). *Evolution of infectious disease*. New York: Oxford University Press.
- Faulkner, J., Schaller, M., Park, J. H. and Duncan, L. A. (2004). Evolved disease-avoidance mechanisms and contemporary xenophobic attitudes. *Group Processes and Intergroup Relations*, *7*, 333-353.
- Fessler, D. M. T., Eng, S. J., and Navarrete, C. D. (2005). Disgust sensitivity is elevated in the first trimester of pregnancy: Evidence supporting the compensatory prophylaxis hypothesis. *Evolution and Human Behavior*, *26*, 344-351.

- Fessler, D. M. T., and Navarrete, C. D. (2003) Meat is good to taboo: Dietary proscriptions as a product of the interaction of psychological mechanisms and social processes. *Journal of Cognition and Culture*, 3, 1-40.
- Fessler, D. M. T., and Navarrete, C. D. (2004) Third-party attitudes toward sibling incest: Evidence for Westermarck's hypotheses. *Evolution and Human Behavior*, 25, 277-294
- Fincher, C. L., and Thornhill, R. (2008). Assortative sociality, limited dispersal, infectious disease and the genesis of the global pattern of religion diversity. *Proceedings of the Royal Society B*, 275, 2587-2594.
- Fincher, C. L., Thornhill, R., Murray, D. R., and Schaller, S. (2008). Pathogen prevalence predicts human cross-cultural variability in individualism/collectivism. *Proceedings of the Royal Society B*, 275, 1279-1285.
- Gangestad, S. W., and Buss, D. M. (1993). Pathogen prevalence and human mate preferences. *Ethology and Sociobiology*, 14, 89-96.
- Gelman, A., Shor, B., Bafumi, J., and Park, D. (2007). Rich state, poor state, red state, blue state: What's the matter with Connecticut? *Quarterly Journal of Political Science*, 2, 345-367.
- Graham, J., Haidt, J., and Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal of Personality and Social Psychology*, 96, 1029-1046.
- Haidt, J., and Graham, J. (2007). When morality opposes justice: Conservatives have moral intuitions that liberals may not recognize. *Social Justice Research*, 20, 98-116.
- Haidt, J., and Hersh, M. A. (2001). Sexual morality: The cultures and emotions of conservatives and liberals. *Journal of Applied Social Psychology*, 31, 191-221.
- Haidt, J., McCauley, C., and Rozin, P. (1994). Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors. *Personality and Individual Differences*, 16, 701-713.
- Hamilton, W. D., Axelrod, R., and Tanese, R. (1990). Sexual reproduction as an adaptation to resist parasites. *Proceedings of the National Academy of Sciences of the USA*, 87, 3566-3573.
- Inbar, Y., Pizarro, D. A., and Bloom, P. (2009). Conservatives are more easily disgusted than liberals. *Cognition and Emotion*, 23, 714-725.
- Jost, J. T. (2006). The end of ideology. *American Psychologist*, 61, 651-670.
- Jost, J. T., Nosek, B. A., and Gosling, S. D. (2008). Ideology: Its resurgence in social, personality, and political psychology. *Perspectives on Psychological Science*, 3, 126-136.
- Knight, K. (1999). Liberalism and conservatism. In J. P. Robinson, P. R. Shaver, and L. S. Wrightsman (Eds.), *Measures of political attitudes* (pp. 59-158). San Diego, CA: Academic Press.
- Kurzban, R., Dukes, A., and Weeden, J. (2010). Sex, drugs, and moral goals: Reproductive strategies and views about recreational drug use. *Proceedings of the Royal Society B*, 277, 3501-3508.
- Kurzban, R., and Leary, M. R. (2001). Evolutionary origins of stigmatization: The functions of social exclusion. *Psychological Bulletin*, 127, 187-208.

- Laythe, B., Finkel, D. G., Bringle, R. G., and Kirkpatrick, L. A. (2002). Religious fundamentalism as a predictor of prejudice: A two-component model. *Journal for the Scientific Study of Religion*, 41, 623-635.
- Letendre, K., Fincher, C., and Thornhill, R. (in press). Does infectious disease cause global variation in the frequency of intrastate armed conflict and civil war? *Biological Reviews*.
- Li, Y. L., Cohen, A. B., Weeden, J., and Kenrick, D. T. (2010). Mating competitors increase religious beliefs. *Journal of Experimental Social Psychology*, 46, 428-431.
- Lieberman, D., Tooby, J., and Cosmides, L. (2007). The architecture of human kin detection. *Nature*, 445, 727-731.
- Low, B. S. (1990). Marriage systems and pathogen stress in human societies. *American Zoologist*, 30, 325-339.
- Mortensen, C. R., Becker, D. V., Ackerman, J. A., Neuberg, S. L., and Kenrick, D. T. (2010). Infection breeds reticence: The effects of disease salience on self-perceptions of personality and behavioral avoidance tendencies. *Psychological Science*, 21, 440-447.
- Navarrete, C. D., and Fessler, D. M. T. (2006). Disease avoidance and ethnocentrism: The effects of disease vulnerability and disgust sensitivity on intergroup attitudes. *Evolution and Human Behavior*, 27, 270-282.
- Navarrete, C. D., Fessler, D. M. T., and Eng, S. J. (2007). Elevated ethnocentrism in the first trimester of pregnancy. *Evolution and Human Behavior*, 28, 60-65.
- Oaten, M., Stevenson, R. J., and Case, T. I. (2009). Disgust as a disease-avoidance mechanism. *Psychological Bulletin*, 135, 303-321.
- Olatunji, B. O., Williams, N. L., Tolin, D. F., Sawchuk, C. N., Abramowitz, J. S., Lohr, J. M., and Elwood, L. (2007). The disgust scale: Item analysis, factor structure, and suggestions for refinement. *Psychological Assessment*, 19, 281-297.
- Oum, R. E., Lieberman, D., and Aylward, A. (in press). A feel for disgust: Tactile cues for pathogen presence. *Cognition and Emotion*.
- Park, J. H., Faulkner, J., and Schaller, M. (2003). Evolved disease-avoidance processes and contemporary anti-social behavior: Prejudicial attitudes and avoidance of people with physical disabilities. *Journal of Nonverbal Behavior*, 27, 65-87.
- Park, J. H., Schaller, M., and Crandall, C. S. (2007). Pathogen-avoidance mechanisms and the stigmatization of obese people. *Evolution and Human Behavior*, 28, 410-414.
- Pearl, J. (2000). *Causality: Models, reasoning, and inference*. Cambridge, MA: Cambridge University Press.
- Pratto, F., Sidanius, J., Stallworth, L. M., and Malle, B. F. (1994). Social dominance orientation: A personality variable predicting social and political attitudes. *Journal of Personality and Social Psychology*, 67, 741-763.
- Rhodes, G., Chan, J., Zebrowitz, L. A., and Simmons, L. W. (2003). Does sexual dimorphism in human faces signal health? *Proceedings of the Royal Society of London B*, 270, S93-S95.
- Rozin, P., and Fallon, A. (1987). A perspective on disgust. *Psychological Review*, 94, 23-41.
- Schaller, M., and Duncan, L. A. (2007). The behavioral immune system: Its evolution and

- social psychological implications. In J. P. Forgas, M. G. Haselton, and W. von Hippel (Eds.), *Evolution and the social mind: Evolutionary psychology and social cognition* (pp. 293-307). New York: Psychology Press.
- Schaller, M., and Murray, D. R. (2008). Pathogens, personality and culture: Disease prevalence predicts worldwide variability in sociosexuality, extraversion, and openness to experience. *Journal of Personality and Social Psychology, 95*, 212–221.
- Sherman, P. W., and Billing, J. (1999). Darwinian gastronomy: Why we use spices. *BioScience, 49*, 453–463.
- Thornhill, R., Fincher, C. L., Murray, D. R., and Schaller, M. (2010). Zoonotic and non-zoonotic diseases in relation to human personality and societal values: Support for the parasite stress model. *Evolutionary Psychology, 8*, 151-169.
- Thornhill, R., Fincher, C. L., and Aran, D. (2009). Parasites, democratization, and the liberalization of values across contemporary countries. *Biological Reviews, 84*, 113–131.
- Thornhill, R., and Gangestad, S. W. (2006). Facial sexual dimorphism, developmental stability, and susceptibility to disease in men and women. *Evolution and Human Behavior, 27*, 131-144.
- Tybur, J. M., Lieberman, D., and Griskevicius, V. (2009). Microbes, mating, and morality: Individual differences in three functional domains of disgust. *Journal of Personality and Social Psychology, 97*, 103-122.
- Van Valen, L. (1973). A new evolutionary law. *Evolutionary Theory, 1*, 1-30.
- Weeden, J., Cohen, A. B., and Kenrick, D. T. (2008) Religious attendance as reproductive support. *Evolution and Human Behavior, 29*, 327–334.