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Benjamin C. Ruisch, Rajen A. Anderson, Yoel Inbar, and David A. Pizarro

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A Matter of Taste: Gustatory Sensitivity Predicts Political Ideology

Benjamin C. Ruisch
Ohio State University

Rajen A. Anderson
Cornell University

Yoel Inbar
University of Toronto

David A. Pizarro
Cornell University

Previous research has shown that political attitudes are highly heritable, but the proximal physiological mechanisms that shape ideology remain largely unknown. Based on work suggesting possible ideological differences in genes related to low-level sensory processing, we predicted that taste (i.e., gustatory) sensitivity would be associated with political ideology. In 4 studies (combined $N = 1,639$) we test this hypothesis and find robust support for this association. In Studies 1–3, we find that sensitivity to the chemicals PROP and PTC—2 well established measures of taste sensitivity—are associated with greater political conservatism. In Study 4, we find that fungiform papilla density, a proxy for taste bud density, also predicts greater conservatism, and that this association is partially statistically mediated by disgust sensitivity. This work suggests that low-level physiological differences in sensory processing may shape an individual's political attitudes.




Keywords: conservatism, gustation, ideology, politics, taste

Tensions between the political left and right have been growing in recent years, with greater polarization, increased animosity, and less willingness to “reach across the aisle” to engage with individuals of the opposing ideology (McCoy, Rahman, & Somer, 2018; Pew Research Center, 2014, 2016, 2017a; Reiljan, 2019). Indeed, recent polls suggest that the liberal–conservative divide is now one of the most contentious divisions in modern American society, often eliciting more explicit antipathy than divisions based on race, religion, or social class (Iyengar & Westwood, 2015; Pew Research Center, 2016, 2017a, 2017b). However, although the ideological gap has been particularly acrimonious in recent years, the divide between the political right and left is nothing new. This core ideological dimension has exhibited remarkable stability across both time and cultures (Bobbio, 1996; Burke, 1790/1987; Huber & Inglehart, 1995; Jost, 2006; Jost, Glaser, Kruglanski, & Sulloway, 2003a; Lukes, 2003; McCarty, Poole, & Rosenthal, 2006; Rosas & Ferreira, 2014), with social and political systems

often being characterized by a push-and-pull between these two opposing mindsets.

Adherents of these two “political ideologies”—here, defined as “set[s] of beliefs about the proper order of society and how it can be achieved” (Erikson & Tedin, 2003, p. 64)—hold opposing positions across a wide range of domains. Research suggests that those on the political right—often called “conservatives” in the United States and many Western nations—tend to be relatively more concerned with maintaining societal order, structure, and stability, and are more resistant to social change and more tolerant of inequality between social groups (Erikson & Tedin, 2003; Jost et al., 2003a, 2003b; McClosky & Zaller, 1984; Rathbun, 2007). Those on the political left—often called “progressives” or, in the United States, “liberals”—tend to be more open to societal change and to prefer less hierarchical relations between groups (*ibid.*).

Although ideological belief systems are complex (e.g., consisting of partially independent facets of economic and social/cultural beliefs; Duckitt, Wagner, Du Plessis, & Birum, 2002; Evans, Heath, & Lalljee, 1996; Layman & Carsey, 2002; Saucier, 2000; Stenner, 2005), and the exact political policies endorsed by each of these ideological groups can to some degree vary as a function of the specific political system in which they are embedded (Benoit & Laver, 2006; Fuchs & Klingemann, 1990), these broad left-right “political orientations” play a central role in structuring political thought and behavior and do so in reliable ways (Benoit & Laver, 2006; Bobbio, 1996; Fuchs & Klingemann, 1990; Jacoby, 1991; Jost, 2006; Lukes, 2003; Tomkins, 1963). For example, those on the right tend to support political policies that impose harsher punishments for criminals and social “deviants” or norm-violators (e.g., the death penalty, mandatory minimum sentences), to support more aggressive foreign policy (e.g., militaristic responses to

 Benjamin C. Ruisch, Department of Psychology, Ohio State University;  Rajen A. Anderson, Department of Psychology, Cornell University; Yoel Inbar, Department of Psychology, University of Toronto;  David A. Pizarro, Department of Psychology, Cornell University.

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Correspondence concerning this article should be addressed to Benjamin C. Ruisch, Department of Psychology, Ohio State University, 110 Lazenby Hall, Columbus, OH 43210. E-mail: ruisch.3@osu.edu

conflict), and to be less supportive of redistributive economic policies (e.g., social welfare¹; Fuchs & Klingemann, 1990; Jacobs & Carmichael, 2002; Jost et al., 2003a; Marcus, Sullivan, Theiss-Morse, & Wood, 1995; Skitka, 1999; Skitka & Tetlock, 1993a, 1993b; Tetlock et al., 2007; Tyler & Weber, 1982). Those on the left tend to endorse the inverse set of policy preferences, supporting less punitive responses to crime and violations of social norms, less aggressive foreign policy (e.g., favoring diplomacy over military action), and greater support for economic redistribution (*ibid.*).

However, the differences between those on the right and left are not limited to political attitudes and behavior. Indeed, decades of research has revealed that liberals and conservatives differ in numerous aspects of everyday behavior (e.g., pastimes, jobs/careers, social groups; DellaPosta, Shi, & Macy, 2015; Pew Research Center, 2014; Verdant Labs, 2016; Wilson, Ausman, & Mathews, 1973), values (e.g., conformity, self-expression; Schwartz, Caprara, & Vecchione, 2010; Schwartz et al., 2014), preferences (e.g., in art, humor, poetry, cuisines; Epstein, 2014; Gillies & Campbell, 1985; Mikol, 1960; Ruch & Hehl, 1986; Schneider, 1985; Wilson et al., 1973; Yakovlev & Guessford, 2013), and beyond. Generally speaking, those on the political right tend to show more appreciation for tradition, to place greater value on social conformity or “fitting in” and to be less likely to seek out novel and unfamiliar experiences. Conversely, those on the left tend to value self-expression and uniqueness, and to be more open to new and unfamiliar experiences. In sum, the divide between the right and left is not simply a political one; those of opposing ideologies have remarkably different values, lifestyles, and cultures.

The breadth, depth, and stability of the differences between liberals and conservatives led early researchers and theorists to speculate that political ideology might be driven by deeper psychological traits and motivations that are not specific to the political realm (Adorno, Frenkel-Brunswik, Levinson, & Sanford, 1950; Altemeyer, 1998; Frenkel-Brunswik, 1949; Tomkins, 1963; Wilson, 1973). More than 70 years of research has borne out this prediction, revealing robust ideological differences in many aspects of basic psychology, including cognition/cognitive style (e.g., attention to negative situations and stimuli; Hibbing, Smith, & Alford, 2014), major dimensions of personality (e.g., openness to experience, conscientiousness; Gerber, Huber, Doherty, Downing, & Ha, 2010), emotional experience (e.g., sensitivity to disgust; Inbar, Pizarro, & Bloom, 2009), and psychological motivations (e.g., needs for structure, certainty, and cognition; Chirumbolo, 2002; Cichocka & Dhont, 2018; Jost et al., 2003a; Kimmelmeier, 1997; for a recent meta-analysis, see Jost, Sterling, & Stern, 2018).

However, recent research has suggested that the foundations of political ideology may go even deeper than previously believed and that individual differences in political ideology may also stem from more basic biological differences between individuals. This work has suggested that a person’s genetic makeup plays a significant role in determining their political orientation—by some estimates explaining 30% to 60% of the variance in political liberalism/conservatism (Hatemi et al., 2014). However, the proximal mechanisms by which these observed genetic differences are translated into political attitudes and behavior remain largely unknown.

One intriguing possibility is that at least some of the observed variability in ideology is attributable to genetic influences on low-level physiological mechanisms, such as those that govern sensory perception. This possibility was suggested by Hatemi et al. (2011), who conducted a genome-wide analysis of 13,000 people to identify the specific genomic regions that accounted for the heritability of political attitudes. Their analysis identified several regions that accounted for variance in respondents’ liberalism/conservatism. Interestingly, one of these regions, on chromosome 9, contained a large number of genes related to taste and olfaction (Lacazette, Pitiot, Jobert, Mallet, & Gachon, 1997; Rajab et al., 2008), suggesting that individual differences in sensory processing may relate to political ideology.

Two additional areas of research converge to suggest possible associations between sensation, particularly gustation, and political ideology. They also suggest a possible psychological mechanism for this association: sensitivity to disgust.

Taste and Disgust

Researchers have posited a deep and evolutionarily ancient connection between taste and disgust. Specifically, some elements of taste (particularly bitterness perception) are believed to have evolved to detect potentially poisonous and pathogen-laden features of our environment, such as poisonous plants and rotten food (Curtis & Biran, 2001). These stimuli elicit an unpleasant (usually bitter or sour) taste sensation, which triggers a set of physiological and behavioral responses (e.g., opening of the mouth, projection of the tongue) that serve to prevent the ingestion of the offending substance.

The emotion of disgust is believed by many to have its origins in this initial oral rejection response (Rozin, Haidt, & McCauley, 2008; Tybur, Lieberman, Kurzban, & DeScioli, 2013). It is argued that this system was repurposed (or “preadapted,” in evolutionary terms; Mayr, 1960) to respond to other environmental cues and other classes of sensory stimuli (e.g., sights and smells that signal the presence of pathogens) to avoid contamination and disease. Consistent with this theorizing, neuroimaging studies have revealed that the area of the brain that is most often implicated in the disgust response, the anterior insula (Vytal & Hamann, 2010), is also intimately involved both in the processing of taste stimuli and the visceral experience of nausea (Rolls & Scott, 2003; Stern, Koch, & Andrews, 2011).

Providing further support for this connection, research from the sensation and perception literature has recently identified a connection between greater taste sensitivity and heightened sensitivity to disgust. This work has shown that individuals who are more sensitive to the chemical compound PROP, the most widely used measure of taste sensitivity (Bartoshuk, Duffy, & Miller, 1994), are more prone to experiencing certain forms of disgust. Specifically, Herz (2011, 2014) found that individuals who experience greater bitterness in response to the chemical PROP—indicating greater taste sensitivity (Bartoshuk et al., 2003)—also tended to

¹ Although research suggests that welfare attitudes—as well as economic conservatism more broadly—may be more closely related to social conservatism in the United States and other developed Western nations (e.g., Benoit & Laver, 2006; Malka et al., 2019), as will be discussed in more detail below.

experience greater disgust in response to vignettes depicting situations with the potential for contamination or the transmission of disease. Given that taste sensitivity (e.g., sensitivity to PROP, taste receptor density) has been shown to be largely genetically determined (e.g., with a single gene *TASR238* being responsible for 58% of the phenotypic variation in PROP bitterness sensitivity; Barbarossa et al., 2015), this work suggests that having a more sensitive sense of taste may predispose a person toward developing a heightened sense of disgust.

Disgust and Political Ideology

Recent social psychological research has demonstrated that disgust sensitivity, in turn, may have implications for political attitudes. This work has reliably found that greater dispositional sensitivity to disgust is associated with greater political conservatism (e.g., Inbar et al., 2009; Terrizzi, Shook, & McDaniel, 2013). This association is primarily attributable to a relation between higher dispositional disgust sensitivity and greater cultural traditionalism and sexual restrictiveness (vs. permissiveness; Tybur, Inbar, Güler, & Molho, 2015; Tybur et al., 2016). Specifically, this research suggests that individuals with higher disgust sensitivity tend to place greater value on adherence to social norms (which often evolve culturally to limit pathogen transmission; Billing & Sherman, 1998; Schaller & Murray, 2008) as well as to adopt more monogamous (vs. promiscuous) mating strategies (which also serve to limit pathogen transmission; Schaller, 2011; Schaller & Murray, 2008). Because political conservatism tends to align with these concerns/positions (e.g., through harsher punishment of norm violators and favoring traditional vs. nontraditional sexuality; Fuchs & Klingemann, 1990; Jacobs & Carmichael, 2002; Marcus et al., 1995; Sherkat, Powell-Williams, Maddox, & de Vries, 2011; Tyler & Weber, 1982; Whitley, 1999), this leads more disgust-sensitive individuals to tend to adopt more politically conservative ideologies.

Several additional psychological mechanisms have been proposed to explain the relation between disgust and political conservatism. For example, liberals and conservatives tend to differ in the extent to which they regulate the emotion of disgust, with liberals more readily reappraising their disgust away from potentially disgust-inducing stimuli (Feinberg, Antonenko, Willer, Horberg, & John, 2014). Other researchers have posited that disgust is linked to conservatism as a means of avoiding potential pathogen threats brought by contact with outgroups (Fincher & Thornhill, 2012; Thornhill, Fincher, & Aran, 2009). This outgroup prejudice/ingroup favoritism account argues that contact with outgroup members (who may carry pathogens against which the individual has less immunity; Fincher & Thornhill, 2008a, 2008b; Roberts, 1989) is more likely to lead to an infectious disease than contact with ingroup members. However, more recent work suggests that the link between disgust sensitivity and outgroup prejudice (and/or specific political positions like opposition to immigration) is best explained by a connection with the traditional norms of the ingroup (Karinén, Molho, Kupfer, & Tybur, 2019; Tybur et al., 2016). Thus, people who are more easily disgusted, and those induced to feel disgust (e.g., Helzer & Pizarro, 2011; Inbar, Pizarro, & Bloom, 2012), endorse ideological positions that preserve cultural traditions—a position that is associated with political conservatism.

The Present Research

Integrating these various lines of research led us to hypothesize that basic physiological differences in taste sensitivity would be associated with political ideology, such that individuals with more sensitive senses of taste would tend to be more politically conservative, particularly on social and cultural issues. Further, we predicted that this association would be accounted for, at least in part, by sensitivity to disgust. We tested these hypotheses in four studies (total $N = 1,639$), in which we assessed taste sensitivity using commercially available chemical test strips (Studies 1–3) as well as tongue fungiform papilla density (Study 4).

Analytic Plan and Statistical Power

We preregistered two of the four studies we conducted. All deviations from our planned analyses and predicted results are explicitly described in the main text. Following our preregistered analysis plans, we tested our primary predictions using linear regression. In these analyses, all predictors are grand-mean centered, and we report standardized beta weights. We list all predictors and control variables that were included in the models. (If no covariates are stated, none are included.) We exclude no participants: All participants who provided complete, analyzable data are included in our analyses.

We took three additional approaches to maximizing statistical power in the present research. All of these approaches are consistent with current recommendations for best practices. First, we conducted power analyses to determine sample sizes for all studies after Study 1A, using observed effect sizes in power analyses to ensure that our studies were adequately powered. Second, we collected large sample sizes to obtain stable observations of effect sizes. We based these minimum sample sizes on simulation studies indicating that correlational effect sizes of around $r = .1$ (our anticipated effect size, based on a review of the literature) tend to achieve stability of 80% confidence at sample sizes of around 250 participants (Schönbrodt & Perugini, 2013). All four of our studies involved samples larger than 250. Third, following recent best practices recommendations (e.g., McShane & Böckenholt, 2017), we also conducted a random-effects internal meta-analysis of our studies to further increase statistical power and better estimate the true size of any observed effects (Braver, Thoemmes, & Rosenthal, 2014).

All materials, data, syntax, and preregistration documentation are available on the Open Science Framework (OSF) at <https://osf.io/fv436/>.

Study 1

In Study 1, we provided an initial test of the association between taste sensitivity and political conservatism. To do so, we assessed participants' levels of taste sensitivity using a widely used measure of taste sensitivity: taste strips containing the chemical compound 6-n-propylthiouracil (PROP). PROP is a chemical that, depending on a person's genetically determined level of taste sensitivity, can be extremely bitter, completely tasteless, or anywhere in between (Barbarossa et al., 2015; Bartoshuk et al., 1994). Because sensitivity to PROP is associated with sensitivity to bitterness generally—and, some research suggests, general taste sensitivity (Bar-

toshuk et al., 1994; Tepper, 2008)—it provides an efficient and informative index of individual differences in taste sensitivity.

Method

Participants. For this initial test of our hypothesis, we recruited a convenience sample of students from an introductory psychology course. We included all students who elected to participate in the study, resulting in a total sample of $N = 343$.

Ethics statement. All research was approved by the Cornell University Institutional Review Board under protocol #1601006066, “Taste Sensitivity and Political Ideology.”

Procedure. Participants were provided with a PROP taste strip and a paper survey packet. They were instructed to place the PROP strip on their tongues for 30 s and to rate the bitterness of the strip on two 100-point scales. They then indicated their general political orientation and their social and cultural liberalism/conservatism.

Materials. Taste strips contained 3–5 μg of PROP per strip and were purchased from Sensonics International (sensonics.com).

Participants rated the bitterness of the taste strip on two 100-point quasi-logarithmic scales developed by Bartoshuk and colleagues (Bartoshuk et al., 2003). These scales asked participants to compare the taste sensation from the taste strips with other sensory experiences. The first scale asked participants to compare the intensity of the bitterness to auditory sensations of differing intensities, ranging from “Absolute silence” to “An airhorn next to your ear.” The second scale asked participants to compare the bitterness of the strip to “the full range of sensations that [they] have ever experienced,” ranging from *no sensation* to *strongest imaginable sensation of any kind*. These scales were developed in order to overcome the difficulties inherent to comparing subjective sensory experiences between individuals and have been shown to accurately identify between-subjects differences in taste sensitivity (Bartoshuk et al., 2003).

General political orientation was assessed with the question “Where on the following scale of political orientation would you place yourself?” and social and cultural liberalism/conservatism was assessed with the question “In terms of social and cultural issues, how liberal or conservative are you?” Participants provided their response to each question on a 7-point Likert-type scale ranging from *extremely liberal* to *extremely conservative*.

Results

Twenty-two participants did not provide information about their political ideology, and one additional participant did not rate the bitterness of the taste strip. This left us with a sample of 320 participants with analyzable data. The correlation between our two taste sensitivity scales was high ($r = .83$), so we averaged them into a single index of taste sensitivity.

As predicted, participants who reported greater bitterness from the taste strip (i.e., those with higher taste sensitivity) identified as more politically conservative, both on the measure of general political orientation ($\beta = .14$, $t[318] = 2.46$, $p = .01$), as well as on the measure of social and cultural conservatism ($\beta = .15$, $t[318] = 2.73$, $p = .007$).

Discussion

The results of this study provided initial support for the hypothesized connection between taste sensitivity and political conservatism, using a well-established measure of taste sensitivity. Although these results are correlational and cannot speak to the causal direction of this relation, past research has established that the ability to taste PROP is largely genetically determined (Barbarossa et al., 2015). These findings therefore provide an initial indication that taste sensitivity—particularly sensitivity to bitterness—may play a role in shaping political ideology.

Study 2

In Study 2, we conducted a preregistered conceptual replication and extension of Study 1 using a more diverse sample of participants collected from a student and community center on Cornell University’s campus. For this study, we used another widely used index of general taste sensitivity, phenylthiocarbamide (PTC). Although sensitivities to PROP and PTC are positively related (Barnicot, Harris, & Kalmus, 1951; Lawless, 1980), they are believed to be subject to different genetic controls (Bufe et al., 2005). Further, the genetic basis of sensitivity to PTC has been more extensively studied and is better established (Bufe et al., 2005; Drayna et al., 2003; Hansen, Reed, Wright, Martin, & Breslin, 2006), with an estimated 55% to 85% of the phenotypic variance in PTC sensitivity being determined by three functional single nucleotide polymorphisms of the TAS2R38 gene (Kim et al., 2003). Therefore, in addition to providing further support for a general association between taste and ideology, the existence of ideological differences in sensitivity to PTC would also provide additional evidence suggesting a possible genetic basis for these differences.

We also made two other changes to our experimental design to rule out potential confounds. First, because both age and sex have previously been shown to relate to taste sensitivity (Bartoshuk et al., 1994; Mojet, Christ-Hazelhof, & Heidema, 2001), we asked participants to provide this information to test whether these factors explained the observed association between taste sensitivity and political conservatism. Second, we also asked participants to rate the specific taste that they detected on the test strip (e.g., bitter, sour, salty). This question allowed us to ensure that we were specifically analyzing participants’ ratings of the target chemical PTC (rather than their ratings of the paper strip in which it was embedded). Because past work has shown that people experience the taste of PTC to be bitter, or sometimes sour (Bartoshuk et al., 1994), responses of “salty,” “sweet,” and “no flavor” were interpreted as indicating a lack of ability to taste PTC, as specified in the preregistration for this study.

Method

Participants. We conducted a power analysis for 80% power to detect an effect size of $r/\beta = .145$, the effect size we observed in Study 1. This analysis recommended a sample size of 368 participants, which we increased to 400 to increase statistical power. We preregistered this target sample size for Studies 2 and 3.

Materials and procedure. Research assistants set up a table and invited passersby to participate in the study in exchange for a

piece of chocolate. Participants were provided with a PTC taste strip (purchased from Nasco Precision Laboratories) and a paper survey packet. They were instructed to place the taste strip on their tongue for 30 s. After tasting the test strip, but before rating its intensity, participants were asked to indicate the taste of the strip, with the following response options: no flavor, bitter, salty, sour, or sweet. Participants then rated the intensity of the taste they experienced using the same general intensity scale from Study 1. They then indicated their political orientation and social and cultural liberalism/conservatism using the same scales from Study 1 and provided information about their age and sex. Additionally, participants also answered nine questions regarding their food preferences. As specified in our preregistration documentation, however, the results of these questions were not analyzed in relation to the current research question.

Results and Discussion

Two participants did not indicate their political ideology and therefore could not be included in analyses, leaving us with an analyzable sample of 398 participants.² Seventy-one participants (17.75%) reported no taste from the taste strip, and were therefore coded as “0” for the intensity measure. Additionally, six participants (1.5%) rated the strip as salty and four (1%) rated it as sweet, indicating a lack of ability to taste PTC. Following our preregistered analysis plan, we coded intensity as “0” for these participants. The remainder of the participants indicated that the strip tasted bitter or sour, indicating an ability to detect PTC. (Results are nearly identical if “sour” responses are also coded as indicating a lack of ability to taste PTC.)

Replicating the results of Study 1, we found that greater taste sensitivity—indicated by the intensity of bitterness experienced from the PTC strip—was associated with greater general political conservatism ($\beta = .19$, $t[396] = 3.80$, $p < .001$) and greater social and cultural conservatism ($\beta = .19$, $t[396] = 3.80$, $p < .001$). This association remained significant (and in fact became slightly stronger) when controlling for participants’ age and sex (general conservatism: $\beta = .21$, $t[390] = 4.16$, $p < .001$; social/cultural conservatism: $\beta = .21$, $t[390] = 4.18$, $p < .001$), providing further evidence for the hypothesized association between taste sensitivity and political conservatism.

Study 3

In Study 3, we sought to extend these findings by moving to an issue-based measure of political conservatism, in which we asked participants to indicate their attitudes on 12 political issues. We included this scale to determine whether taste sensitivity would predict individuals’ positions on specific political issues or whether this association held only for overall ideological self-identification. Based on previous research on disgust sensitivity and political ideology (e.g., Tybur et al., 2015), we predicted that taste sensitivity would be most closely correlated with political issues related to traditional sexuality (e.g., LGBT rights, pornography, abortion). Additionally, in this study we also collected a more demographically and ideologically diverse sample recruited from two shopping malls in the northeastern United States.

Method

Participants. Based on the power analysis outlined in Study 2, we set a target sample size of 400 participants. We received 406 responses.

Procedure. Research assistants set up a table and invited passersby to participate in the study in exchange for a piece of chocolate. Participants were provided with a PROP taste strip and a paper survey packet. As in Study 2, participants were first asked to rate the taste of the strip (sweet, salty, sour, bitter, or “no flavor”). They then rated the intensity of the strip using the same general intensity scale from Studies 1 and 2. They then completed the issue-based measure of conservatism, indicated their age and sex, and indicated their general political ideology and social and cultural liberalism/conservatism using the same scales from Studies 1 and 2.

Measures. The taste strips used in this study were the same as those used in Study 1 (purchased from Sensonics International). Our issue-based ideology measure was adapted from Everett (2013). Participants were asked to rate their positivity/negativity toward 12 political issues/values on 11-point scales ranging from $-5 = \textit{extremely negative}$ to $+5 = \textit{extremely positive}$, with the midpoint labeled $0 = \textit{neutral}$. Ten of these items were borrowed or adapted from Everett’s scale. Additionally, we added two items (LGBT rights and pornography) to include a wider range of issues relating to (non)traditional sexuality.

In our preregistration, we designated five items as relating to traditional sexuality: the family unit, traditional marriage, LGBT rights (reverse-scored), abortion rights (reverse-scored), and pornography (reverse-scored). We designated the remaining seven items as nonsexuality relevant: lowering corporate taxes, reducing immigration, gun ownership, limited government, religion, traditional values, and welfare benefits (reverse-scored).

Results

Four participants did not indicate their political ideology, eight did not indicate their social/cultural conservatism, and 14 participants did not complete our issue-based-ideology measure. These participants could therefore not be included in analyses using these measures (although they were included in all other analyses). All other participants provided complete, analyzable data.

As in Study 2, we coded responses of “no flavor” ($n = 88$, 21.57%), “salty” ($n = 5$, 1.23%), and “sweet” ($n = 2$, 0.49%) as “0” for the intensity measure. (Results do not change—and in fact become somewhat stronger—if individuals who rated the strips as “sour” are also coded as “0”.) Reliability for our issue-based measure of conservatism was acceptably high (full 12-item scale $\alpha = .81$; five-item sexuality-relevant subscale $\alpha = .70$; seven-item nonsexuality relevant subscale $\alpha = .73$), so we averaged across the individual items to create separate indices of overall issue-based conservatism, conservatism on issues related to

² Although we sought only to recruit participants aged 18 or older, a number of participants under 18 also participated in our studies (3% of the total sample, $N = 53$). Because we had permission from the Cornell University Institutional Review Board to recruit participants under 18, we include the data from these participants in our analyses. However, our results do not meaningfully change if these participants are excluded from analyses.

traditional sexuality, and conservatism on issues unrelated to traditional sexuality.

In this study, the association between taste sensitivity and self-reported political conservatism was not statistically significant, although it was directionally consistent with our previous studies, with greater taste sensitivity being associated with greater political conservatism ($\beta = .07$, $t[399] = 1.45$, $p = .15$; social conservatism: $\beta = .06$, $t[395] = 1.19$, $p = .23$). When controlling for age and sex, these associations became somewhat stronger: the association between taste sensitivity and general political conservatism was $\beta = .11$, $t(390) = 2.23$, $p = .03$, and the association between taste sensitivity and social/cultural conservatism was $\beta = .1$, $t(386) = 1.91$, $p = .057$.

Additionally, we found that taste sensitivity significantly predicted greater conservatism on the issue-based ideology scale ($\beta = .11$, $t[390] = 2.27$, $p = .02$). This association remained significant when controlling for age and sex ($\beta = .16$, $t[379] = 3.15$, $p = .002$). Interestingly—and contrary to our predictions—this relation was weaker for issues related to traditional sexuality ($\beta = .04$, $t[390] = .70$, $p = .48$; controlling for age and sex: $\beta = .08$, $t[379] = 1.55$, $p = .12$) and was stronger for other political issues (e.g., those related to immigration, gun ownership, and welfare benefits; $\beta = .15$, $t[390] = 3.05$, $p = .002$; controlling for age and sex: $\beta = .13$, $t[379] = 2.56$, $p = .01$).

To better understand the reason for the smaller effect size that we observed with self-identified political orientation in this study, we conducted a meta-analysis (described in detail below) to examine how this effect compared to our other studies. We found that the size of this effect did not significantly differ from those we observed in our other studies (test of heterogeneity of effect sizes: $Q[7] = 8.0$, $p = .33$; test of moderation: $Q[1] = 3.31$, $p = .07$). This suggests that the relatively smaller effect size documented in this study was likely due to random variation between samples, rather than to any meaningful difference between the studies (Lakens & Etz, 2017). Although it is common in the scientific literature to report only significant results (Fanelli, 2010), we nonetheless report this study here in order to increase transparency in our research (Lakens & Etz, 2017) and to provide a more accurate estimate of the true size of this effect (Braver et al., 2014).

Discussion

Although the association between taste sensitivity and self-reported conservatism was not statistically significant in this study, the effect was directionally consistent with our previous studies, and did not significantly differ from our other studies. Furthermore, the significant association that we observed between taste sensitivity and the issue-based measure of political ideology constitutes a conceptual replication of our previous studies using a different measure of conservatism, providing convergent evidence in support of our hypothesis that higher taste sensitivity is associated with greater political conservatism.

The pattern of results with the individual political issues (see Table 1), although contrary to our predictions, also offers potential insight into the nature of this effect. Taste sensitivity significantly predicted more conservative positions on three of the 12 political issues/values: gun ownership, welfare benefits, and religion. Although these analyses are post hoc and should therefore be interpreted with caution, it is notable that these issues are all closely related to intergroup attitudes and orientations (Brown-Iannuzzi, Dotsch, Cooley, & Payne, 2017; Johnson, Rowatt, & LaBouff, 2012; O'Brien, Forrest, Lynott, & Daly, 2013). This pattern of results appears consistent with recent theory and research on the nature of the relation between disgust sensitivity and conservatism, which suggests that disgust sensitivity may lead to greater conservatism specifically on issues that relate to outgroup aggression and promotion of ingroup norms (e.g., Aarøe, Petersen, & Arceneaux, 2017). Also consistent with this perspective, the issue that related most directly to economic conservatism—and least directly related to social conservatism—“reducing corporate taxes,” showed no association whatsoever with taste sensitivity ($\beta = -.005$, $p = .92$). Although this pattern of results appears to be consistent with our hypothesized disgust-based explanation for the relation between taste and conservatism, in Study 4 we directly measured disgust sensitivity in order to provide a more decisive test of this prediction.

Study 4

We next sought to assess taste sensitivity with a more objective measure that did not rely on participants' self-reported taste expe-

Table 1

Zero-Order Correlation Table Showing the Relations Between Taste Sensitivity and Degree of Positivity Towards Each of the 12 Political Issues/Values Included in Our Issue-Based Conservatism Measure (Adapted From Everett, 2013) in Study 3

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Taste sensitivity	—											
2. Traditional marriage	.07	—										
3. Pornography	-.06	-.25	—									
4. LGBT rights	.03	-.41	.26	—								
5. Abortion rights	.001	-.40	.26	.59	—							
6. The family unit	.03	.51	-.2	-.18	-.19	—						
7. Corporate taxes	-.005	.18	-.08	-.25	-.31	.12	—					
8. Limited government	.08	.25	-.05	-.19	-.18	.18	.30	—				
9. Welfare	-.14	-.20	.06	.35	.30	-.09	-.20	-.26	—			
10. Traditional values	.06	.55	-.23	-.32	-.37	.49	.24	.31	-.32	—		
11. Reducing immigration	.09	.33	-.07	-.46	-.33	.17	.17	.36	-.49	.37	—	
12. Religion	.13	.33	-.29	-.27	-.36	.33	.10	.15	-.11	.42	.17	—
13. Gun control	.18	.34	.07	-.30	-.32	.21	.23	.35	-.43	.39	.51	.23

Note. Bolded items are those that we designated as relating to traditional sexuality. A correlation of 0.1 is statistically significant at $p < .05$, two tailed.

riences. To do so, in this study we used a direct physiological measure of taste sensitivity: the density of fungiform papillae on participants' tongues. Fungiform papillae are small mushroom-shaped structures on the surface of the tongue that are the primary location of taste receptors (Miller, 1986). Greater fungiform papilla density indicates greater taste receptor density and thus higher taste sensitivity (Miller, 1986; Zuniga et al., 1993). Importantly, because fungiform papillae can be directly observed, they provide a more objective means of assessing taste sensitivity (Shahbake, Hutchinson, Laing, & Jinks, 2005; Zuniga et al., 1993).

Additionally, in this study we included a measure of disgust sensitivity to assess whether disgust sensitivity accounts for the association between taste sensitivity and political orientation. We also collected information about participants' degree of economic conservatism. Because economic conservatism is not reliably related to disgust sensitivity (e.g., Inbar et al., 2009; Inbar, Pizarro, Iyer, & Haidt, 2012; Olatunji, 2008; Smith, Oxley, Hibbing, Alford, & Hibbing, 2011; Terrizzi, Shook, & Ventis, 2010), we predicted that economic conservatism would *not* be associated with taste sensitivity—a pattern of results that would provide additional convergent support for our hypothesized mechanism of disgust. Finally, we included a wider range of demographic questions (e.g., race/ethnicity, income) to more conclusively rule out the possibility that demographic factors might account for our observed effects.

Method

Participants. In this study, we increased our target sample size from 400 to 500, given the additional uncertainty associated with using a different measure of taste sensitivity. We recruited a mix of students, staff, faculty, and community members of diverse demographic backgrounds from a student and community center on Cornell University's campus. Ten participants did not complete their survey packet, leaving us with a final sample of 490 participants.

Materials and procedure. Research assistants set up a table and invited passersby to participate in the study in exchange for a piece of chocolate. Individuals who chose to participate were provided a paper survey packet and were guided through the papilla-counting procedure. To assess fungiform papilla density, we used a well-established staining procedure (Shahbake et al., 2005). Participants were first provided a vial of blue food coloring and a cotton swab with which they dyed the anterior (i.e., front) portion of their tongues. They were then given a small plastic ring (1/4" diameter) and were instructed to place the ring near the tip of their tongue, just to the left of center (see Shahbake et al., 2005 for detail). A research assistant then photographed each participant's tongue using a high-resolution camera.

Participants then completed the five-item contamination subscale of the revised Disgust Scale (DS-R; Haidt, McCauley, & Rozin, 1994; Olatunji et al., 2007), which served as our measure of disgust sensitivity. They then indicated their general political orientation and social and cultural liberalism/conservatism using the same scales from Studies 1–3. They also indicated their degree of economic liberalism/conservatism: "In terms of *economic issues*, how liberal or conservative are you?" (Consistent with our items assessing general and social/cultural conservatism, participants responded on a 7-point scale ranging from *extremely liberal* to

extremely conservative.) Participants then provided demographic information: age, sex, and income. They also indicated their race/ethnicity by choosing any combination of the following eight racial/ethnic categories: White, Black, Latino/Hispanic, East Asian/Pacific Islander, Native American, Southeast Asian, Middle Eastern, and Other Ethnicity. Participants also completed several exploratory measures. (These measures did not moderate any of our observed effects and are therefore not discussed further. See OSF page for all measures.) Fungiform papilla density, defined as the number of papillae within the area demarcated by the plastic ring, was assessed by a trained research assistant at the study site. Two additional trained research assistants later independently assessed papilla density off-site.

Results

The assessments of fungiform papilla density were highly reliable, $ICC(2,3) = .87$, and were therefore averaged into a single index of papilla density. The photographs for 15 participants could not be matched to their survey packets because of poor quality photographs and were coded only by a single research assistant at the study site. We therefore do not include these participants in analyses (however, the results are nearly identical if only this single coder's score is used and these participants are included in analyses). An additional three participants did not complete the disgust sensitivity scale, and therefore could not be included in analyses that examined this measure.

As predicted, we again found that greater taste sensitivity—as measured by higher fungiform papilla density—predicted greater social/cultural conservatism ($\beta = .15$, $t[473] = 3.35$, $p = .001$; Table 2). Fungiform papilla density was also directionally, although nonsignificantly, associated with greater general political conservatism ($\beta = .08$, $t[473] = 1.8$, $p = .07$; Figure 1). Also supporting our predictions, the association between papilla density and economic conservatism was significantly weaker than that between papilla density and social conservatism, $F(1, 473) = 4.19$, $p = .04$, and was not statistically significant ($p = .52$), providing additional convergent evidence suggesting that disgust sensitivity may be a psychological mechanism underlying this association.

We also verified that demographic factors could not explain this effect. Given that race/ethnicity has been shown to relate both to political orientation and to taste sensitivity, we were particularly stringent in controlling for this variable. We first dummy-coded all eight options of our race/ethnicity question ("1" if selected, "0" if not). We then entered all eight of these variables as covariates in

Table 2
Zero-Order Correlation Table Showing the Relations Between Taste Sensitivity, Disgust Sensitivity, and Our Two Measures of Conservatism (General and Social) in Study 4

Variable	1	2	3	4	5
1. Taste sensitivity	—				
2. Disgust sensitivity	.19***	—			
3. Social conservatism	.15**	.25***	—		
4. General conservatism	.08	.14**	.66***	—	
5. Economic conservatism	.03	-.02	.32***	.66***	—

** $p < .01$. *** $p < .001$.

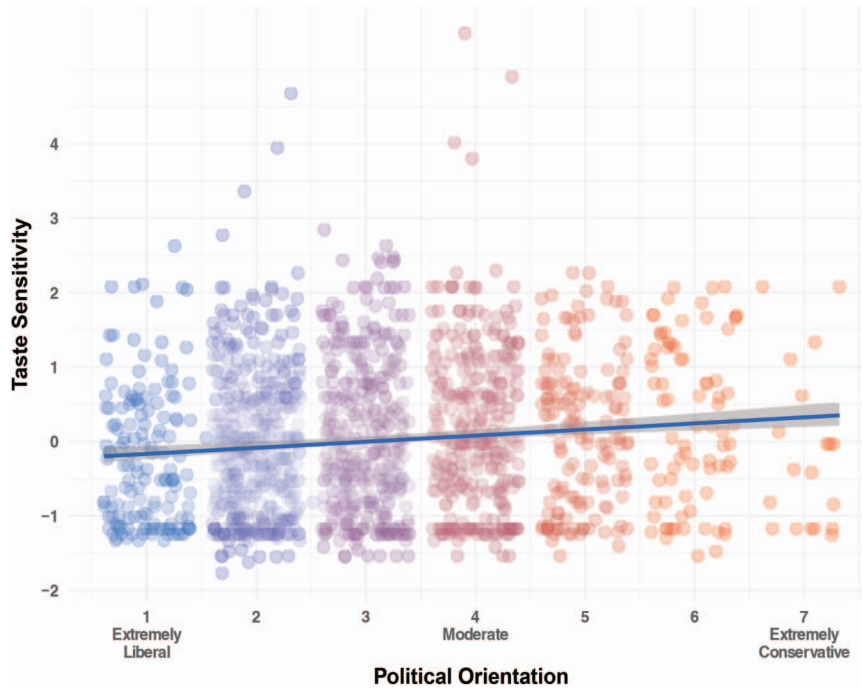


Figure 1. Scatterplot illustrating the relation between taste sensitivity (standardized) and political orientation, Studies 1–4. The x axis represents the 7-point measure of general political orientation used in all studies, with horizontal jitter added for ease of interpretation. See the online article for the color version of this figure.

the regression model, along with age, gender, and income. The results of this analysis revealed that the association between taste sensitivity and conservatism was nearly identical when controlling for these variables (social/cultural conservatism: $\beta = .16$, $t[426] = 3.25$, $p = .001$; general conservatism: $\beta = .08$, $t[426] = 1.72$, $p = .09$).

We then examined whether disgust sensitivity statistically mediated this association. To test for mediation, we used the PROCESS macro for SPSS (Hayes, 2012) to estimate the indirect effect using 10,000 bootstrapped samples. As predicted, we found that disgust sensitivity significantly statistically mediated the association between papilla density and social conservatism (indirect effect 95% CI [.02,.07]), with 35% of the total effect mediated through disgust. Although these data are only cross-sectional and therefore cannot speak to causal direction, these findings are consistent with our prediction that the relation between taste sensitivity and ideology is at least partially accounted for by sensitivity to disgust.

Internal Meta-Analysis

Following recent best-practices recommendations (e.g., McShane & Böckenholt, 2017), we conducted an internal, “within-paper” meta-analysis to determine the average effect size of the taste sensitivity-conservatism association. We used a random-effects model to better extrapolate these effects beyond the current studies to the general population (Hedges & Vevea, 1998). Because we had a nested structure, with measures of both general and social conservatism collected from the same participants, we fit a multilevel meta-analysis model (see Konstantopoulos, 2011),

specifying nested random effects for study and measure type (general vs. social conservatism). The average effect size across these studies was $\beta = .13$ ($SE = .026$, $z = 4.87$, $p = .000001$, Figure 2), and the 95% confidence interval for the true effect size was $\beta = .08$ –.18. We also computed separate average effect sizes for general conservatism and social conservatism. Both analyses yielded similar estimates (general conservatism: $\beta = .12$, $SE = .029$, $z = 4.12$, $p < .0001$, 95% CI [.06, .18]; social conservatism: $\beta = .14$, $SE = .028$, $z = 5.01$, $p < .0001$, 95% CI [.08, .19]). Cochran’s Q -test was not significant ($p = .33$), suggesting that our effect sizes were relatively homogenous.

General Discussion

Across four studies using diverse methods, including sensitivity to the chemical compound 6-n-propylthiouracil (PROP) and a physiological measure of tongue taste receptor density, we found consistent evidence that individuals higher in taste sensitivity were more politically conservative than those lower in taste sensitivity (Figures 1 and 2). We also found evidence (Study 4) that this association may be at least partially explained by the link between higher taste sensitivity and heightened sensitivity to disgust.

Limitations and Future Directions

Sample diversity. Although the participants in these studies were all recruited from the Cornell University campus and surrounding communities, they were nonetheless demographically diverse. Participants spanned an age range of 73 years, and in Study 4, 49% of the sample identified as non-White and 27% were

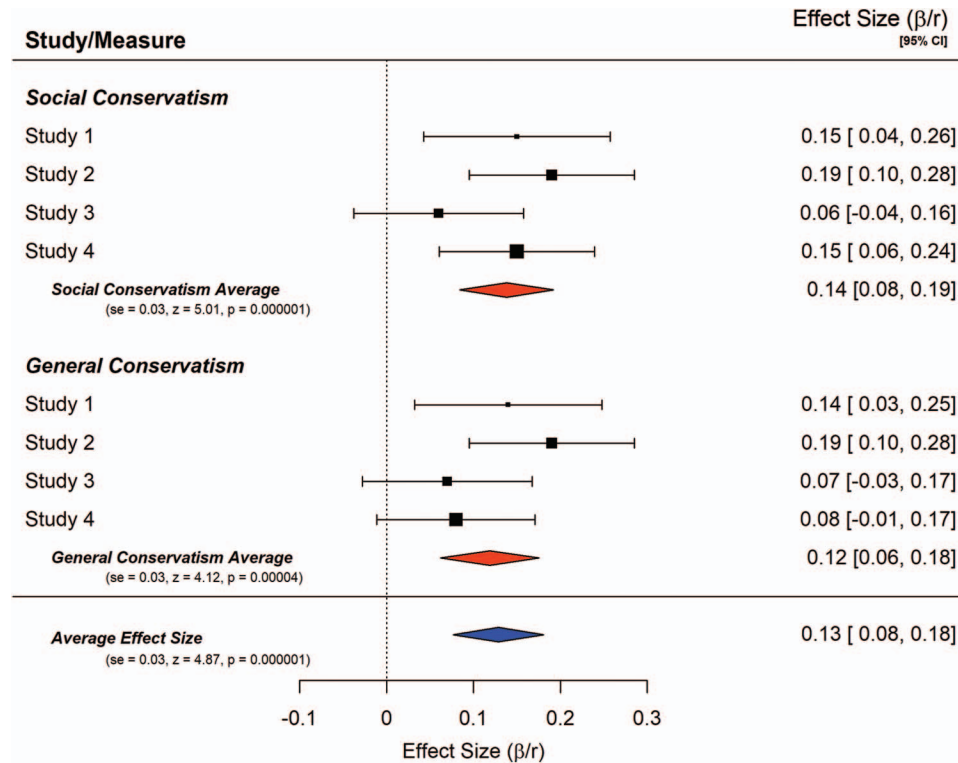


Figure 2. Forest plot from internal meta-analysis illustrating the relation between taste sensitivity and both social and general conservatism, Studies 1–4. See the online article for the color version of this figure.

born outside of the United States. Further, the observed relation between taste sensitivity and political conservatism was not moderated by age, gender, race/ethnicity, income, or whether or not the participant was born in the U.S. (all *ps* > .15), suggesting that the taste-ideology link emerges to an equal degree across these major demographic dimensions. These findings, as well as the fact that both the taste-disgust and disgust-conservatism links have been documented by other research groups (e.g., Herz, 2011; Terrizzi et al., 2013), have strong theoretical support (Rozin et al., 2008; Tybur et al., 2013, 2015), and, in the case of the disgust-conservatism association, have been observed across different cultures (Aarøe et al., 2017; Terrizzi et al., 2013), lead us to conclude that the observed association between taste sensitivity and ideology is likely to generalize beyond the samples examined here. Nevertheless, future research should continue to examine the degree to which these associations generalize to other nations and cultures.

Relatedly, an additional remaining question concerns the degree to which the effects documented in these studies are truly indicative of associations with political ideology *in general*, versus individual facets of ideology. Although our predictions in these studies concerned how taste would relate to social and cultural conservatism in particular, in most of our studies we found that taste sensitivity exhibited a similarly strong relation with general political orientation. However, past research provides reason to suspect that these associations with general conservatism may be unique to Western democratic nations such as the United States.

As discussed above, although the left–right dimension is ubiquitous in politics (Bobbio, 1996; Burke, 1790/1987; Huber &

Inglehart, 1995; Jost, 2006; Jost et al., 2003a; Lukes, 2003; McCarty et al., 2006; Rosas & Ferreira, 2014), research has increasingly suggested that there exist independent facets or dimensions of ideology (Duckitt et al., 2002; Evans et al., 1996; Layman & Carsey, 2002; Saucier, 2000; Stenner, 2005) and that these may be driven by distinct psychological motivations (Altemeyer, 1998; Duckitt et al., 2002; Kossowska & Van Hiel, 2003; Malka & Soto, 2015; Sibley & Duckitt, 2008). The most important and well-studied among these dimensional distinctions is that between social/cultural conservatism—conservatism on issues such as immigration and sexual morality (e.g., gay marriage, abortion)—and economic conservatism—conservatism on issues related to economic redistribution and the appropriate scope of government involvement in economic affairs. In recent years, research has suggested that the psychological motivations that are typically posited as underlying political conservatism (e.g., disgust sensitivity, motivations for certainty and safety) might be better characterized as driving social/cultural conservatism specifically (Federico, Fisher, & Deason, 2011; Federico & Goren, 2009; Federico, Johnston, & Lavine, 2014; Feldman, 2013; Feldman & Johnston, 2014; Hibbing et al., 2014; Malka, Lelkes, & Soto, 2019).

Although empirical research has documented associations between these psychological motivations and economic conservatism (e.g., Sterling, Jost, & Pennycook, 2016), some researchers have argued that these associations stem from the fact that social and economic conservatism are positively correlated in the nations where most past research has been conducted (specifically, developed Western nations, and in particular, the United States; Malka et al., 2019). Supporting this contention, research suggests that

associations of the psychological motivations typically thought to underlie conservatism (e.g., disgust sensitivity, epistemic/existential needs) with economic conservatism are typically weaker than those with social conservatism (Duckitt & Sibley, 2009; Federico et al., 2014; Malka & Soto, 2015). Further, these associations with economic conservatism tend to be further attenuated in non-Western nations where social and economic conservatism are less closely related (Duriez, Van Hiel, & Kossowska, 2005; Golec, 2002; Kossowska & Van Hiel, 2003; Malka et al., 2019; Roccato & Ricolfi, 2005).

This argument is particularly relevant in light of recent empirical work suggesting that positive correlations between social and economic conservatism may actually be the exception, rather than the rule. For example, Malka and colleagues (2019) examined the association between social and economic conservatism across 99 nations and found a net negative correlation between these two dimensions of ideology (though see also Benoit & Laver, 2006, who found a positive correlation across 41 of 44 nations). Malka and colleagues argue that although there tends to be a strong correspondence between social and economic conservatism among political elites (Benoit & Laver, 2006; De Vries & Marks, 2012; Gabel & Hix, 2002; Huber & Inglehart, 1995; Wiesehomeier & Benoit, 2009), the same is not always true of the general public. Rather, the correspondence between social and economic conservatism among a citizenry depends on factors such as political sophistication and exposure to elite rhetoric (Bullock, 2011; Federico & Goren, 2009; Federico et al., 2011; Levendusky, 2009; Malka & Lelkes, 2010).

In this research, we included measures examining both of these facets of conservatism—social/cultural and economic—as well as general or “global” political orientation. We reliably found that taste sensitivity was associated not only with the social/cultural dimension of ideology but also with global political orientation. However, it is possible that the nature and strength of this relation with general conservatism may differ as a function of the national context in which it is examined. In particular, the strength of this association may be attenuated in nations in which there is a lower correspondence between social and economic conservatism. International replications will be required to assess these predictions and to determine the degree to which the findings presented here can be generalized to other nations and cultures.

Additional psychological mechanisms. In this research, we found evidence that the association between taste sensitivity and conservatism is statistically mediated by sensitivity to disgust. However, the partial mediation that we observed suggests that disgust sensitivity is only part of the story, and that other psychological mechanisms are likely to play a role in this association. Future research may wish to explore this possibility.

One potentially fruitful area of investigation may be openness to experience. Research suggests that more intense sensory experiences may lead to a relative dominance of negative (vs. positive) sensations (Cantoni, Hudson, Distel, & Laska, 1999; Duffy, Bartoshuk, Striegel-Moore, & Rodin, 1998; Dunn, 1997, 2001; Gilbert & Wysocki, 1991; Miller, Anzalone, Lane, Cermak, & Osten, 2007; Nordin, Broman, Olofsson, & Wulff, 2004; Tomchek & Dunn, 2007). There is evidence that this may be true in the realm of taste sensitivity as well: for people higher in taste sensitivity, bitter, sour, and spicy tastes are often unpleasantly intense and tend

to take greater prominence in taste experiences (Bartoshuk, 2000; Kauer, Pelchat, Rozin, & Zickgraf, 2015).

Research from outside the realm of sensory sensitivity has shown that the frequency and intensity of negative experiences, in turn, influence the way that a person engages with and explores the world around them, with a relatively greater frequency or intensity of negative (vs. positive) experiences inhibiting exploration and openness to novel stimuli (Fazio, Eiser, & Shook, 2004; Fazio, Pietri, Rocklage, & Shook, 2015). Consistent with these findings, there is some evidence suggesting that more taste-sensitive individuals’ greater frequency of negative (vs. positive) taste experiences may lead them to avoid novel or unfamiliar flavors, foods, and cuisines (Bajec & Pickering, 2010; Kauer et al., 2015; Tepper, 2008).

Although research on the behavioral and personality correlates of taste sensitivity has so far been limited to openness *specifically in the culinary realm*, the research above suggests that the frequent negative sensory experiences experienced by those higher in taste sensitivity might have wider influence, perhaps even shaping a person’s general openness to experience. And openness to experience, in turn, is among the most robust personality correlates of political liberalism (e.g., Sibley, Osborne, & Duckitt, 2012). As such, openness to experience appears to hold potential promise as an additional psychological mechanism underlying the association between taste sensitivity and conservatism. Future research will be necessary to fully elucidate the multiple mechanisms that are likely to underlie the taste-conservatism link.

Other sensory domains. Relatedly, future researchers may wish to extend this line of inquiry beyond the realm of taste to other domains of sensory sensitivity. For example, olfaction—or smell—is closely related both to taste (Doty, 2015) as well as disgust (Croy et al., 2013; Croy, Olgun, & Joraschky, 2011). Individual differences in olfaction—for example, heightened sensitivities to certain odorants; specific anosmias or olfactory “blind spots”—may also have the potential to shape political attitudes and behavior.

Research also suggests additional possible pathways by which sensory sensitivity may shape personality and political attitudes. As mentioned above, the relation between sensory sensitivity and propensity toward negative sensory experience is not limited to taste, but appears as though it may hold true across a range of sensory domains. For example, more global forms of heightened sensory sensitivity, such as that which characterizes certain types of sensory processing disorder (Dunn, 1997, 2001), are associated with a high frequency of negative sensory experiences, whereby sensations that are innocuous for most individuals (e.g., indoor lighting, other people’s cologne/perfume, a t-shirt tag touching the back of the neck) are experienced as intensely unpleasant (Dunn, 1997, 2001; Miller et al., 2007; Tomchek & Dunn, 2007).

Based on research (discussed above) demonstrating that the frequency and intensity of negative experiences, in turn, influence exploration and openness to novel stimuli (e.g., Fazio et al., 2004, 2015), we may predict that, for example, individuals with certain olfactory sensitivities individuals may avoid situations or experiences that have the potential to expose them to unfamiliar odors, or that more interoceptively sensitive individuals may avoid situations with the potential to induce unfamiliar bodily sensations. Future research may wish to explore these possibilities, as well as whether these differences in exploratory behavior and openness to

new experiences may even extend beyond these individual sensory domains to shape broader personality traits like openness, risk aversion, and sensitivity to threat—and, in turn, perhaps even more complex belief systems such as political ideology.

The nature of the taste-conservatism association. An additional limitation of this research is the correlational nature of these data. The nature of our variables of interest—taste sensitivity and political ideology—renders them highly resistant to experimental manipulation/intervention. This is particularly true in the case of taste sensitivity: We are aware of no established method of manipulating a person's general level of taste sensitivity. Accordingly, the studies presented here rely on correlational data. However, as discussed above, given that PTC/PROP sensitivity and fungiform papilla density are largely genetically determined, the more probable causal pathway would appear to be that taste sensitivity shapes ideology. Nevertheless, the alternative causal direction—that ideology shapes taste—as well as the possibility that both taste sensitivity and conservatism may be driven by some yet-identified third variable, should be investigated in order to better understand the nature of this association.

Based on the results of these studies, we hypothesize that the association between taste sensitivity and conservatism is likely to develop over time—for example, with greater taste sensitivity first shaping more proximal mediating factors (e.g., disgust sensitivity, openness to experience), which, in turn, guide the development of a person's political belief system. Because political ideologies often crystallize in later adulthood (Alwin, Cohen, & Newcomb, 1991; Converse, 1976; Jennings, 1990; Jennings & Markus, 1984; Miller & Shanks, 1996; Sears & Funk, 1999; though see also Converse, 1970 and Zaller & Feldman, 1992), becoming relatively more inflexible, it seems possible that there may also be more sensitive “window periods” (cf. Sears, 1975, 1983; Sears & Levy, 2003) during which taste sensitivity would play a stronger role in shaping political attitudes. Longitudinal data will be necessary to examine these processes and understand how the taste-conservatism association unfolds over time.

Conclusion

In this research, we identified a novel correlate of political ideology—taste sensitivity—finding evidence that political conservatives generally have more sensitive senses of taste. Although the correlational nature of these data does not allow us to speak to the causal direction of this association, given that both PTC/PROP sensitivity and fungiform papilla density are largely genetically determined, this research suggests that individual differences in taste sensitivity may serve as a biological predisposition that can lead an individual toward adopting one political ideology over another. More broadly, this work constitutes, to our knowledge, the first evidence of an association between low-level physiological differences in sensory sensitivity and complex attitudinal and belief systems and suggests a possible biological mechanism that may underlie the high heritability of ideological beliefs documented in previous research. We hope that this work will prove generative for future research exploring the intersection of sensory processing and higher-level attitudes and beliefs.

References

- Aarøe, L., Petersen, M. B., & Arceneaux, K. (2017). The behavioral immune system shapes political intuitions: Why and how individual differences in disgust sensitivity underlie opposition to immigration. *The American Political Science Review*, *111*, 277–294. <http://dx.doi.org/10.1017/S0003055416000770>
- Adorno, T. W., Frenkel-Brunswik, E., Levinson, D. J., & Sanford, R. N. (1950). *The authoritarian personality*. New York, NY: Harper.
- Altemeyer, B. (1998). The other ‘authoritarian personality’. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (pp. 47–92). New York, NY: Academic Press. [http://dx.doi.org/10.1016/s0065-2601\(08\)60382-2](http://dx.doi.org/10.1016/s0065-2601(08)60382-2)
- Alwin, D. F., Cohen, R. L., & Newcomb, T. M. (1991). *Aging, personality, and social change: Attitude persistence and change over the life-span*. Madison, WI: University of Wisconsin Press.
- Bajec, M. R., & Pickering, G. J. (2010). Association of thermal taste and PROP responsiveness with food liking, neophobia, body mass index, and waist circumference. *Food Quality and Preference*, *21*, 589–601. <http://dx.doi.org/10.1016/j.foodqual.2010.03.007>
- Barbarossa, I. T., Melis, M., Mattes, M. Z., Calò, C., Muroi, P., Crnjar, R., & Tepper, B. J. (2015). The gustin (CA6) gene polymorphism, rs2274333 (A/G), is associated with fungiform papilla density, whereas PROP bitterness is mostly due to TAS2R38 in an ethnically-mixed population. *Physiology & Behavior*, *138*, 6–12. <http://dx.doi.org/10.1016/j.physbeh.2014.09.011>
- Barnicot, N. A., Harris, H., & Kalmus, H. (1951). Taste thresholds of further eighteen compounds and their correlation with P. T. C thresholds. *Annals of Eugenics*, *16*, 119–128. <http://dx.doi.org/10.1111/j.1469-1809.1951.tb02464.x>
- Bartoshuk, L. M. (2000). Comparing sensory experiences across individuals: Recent psychophysical advances illuminate genetic variation in taste perception. *Chemical Senses*, *25*, 447–460. <http://dx.doi.org/10.1093/chemse/25.4.447>
- Bartoshuk, L. M., Duffy, V. B., Fast, K., Green, B. G., Prutkin, J., & Snyder, D. J. (2003). Labeled scales (eg, category, Likert, VAS) and invalid across-group comparisons: What we have learned from genetic variation in taste. *Food Quality and Preference*, *14*, 125–138. [http://dx.doi.org/10.1016/S0950-3293\(02\)00077-0](http://dx.doi.org/10.1016/S0950-3293(02)00077-0)
- Bartoshuk, L. M., Duffy, V. B., & Miller, I. J. (1994). PTC/PROP tasting: Anatomy, psychophysics, and sex effects. *Physiology & Behavior*, *56*, 1165–1171. [http://dx.doi.org/10.1016/0031-9384\(94\)90361-1](http://dx.doi.org/10.1016/0031-9384(94)90361-1)
- Benoit, K., & Laver, M. (2006). *Party policy in modern democracies*. London, UK: Routledge. <http://dx.doi.org/10.4324/9780203028179>
- Billing, J., & Sherman, P. W. (1998). Antimicrobial functions of spices: Why some like it hot. *The Quarterly Review of Biology*, *73*, 3–49. <http://dx.doi.org/10.1086/420058>
- Bobbio, N. (1996). *Left and right: The significance of a political distinction*. Chicago, IL: University of Chicago Press.
- Braver, S. L., Thoemmes, F. J., & Rosenthal, R. (2014). Continuously cumulating meta-analysis and replicability. *Perspectives on Psychological Science*, *9*, 333–342. <http://dx.doi.org/10.1177/1745691614529796>
- Brown-Iannuzzi, J. L., Dotsch, R., Cooley, E., & Payne, B. K. (2017). The relationship between mental representations of welfare recipients and attitudes toward welfare. *Psychological Science*, *28*, 92–103. <http://dx.doi.org/10.1177/0956797616674999>
- Bufe, B., Breslin, P. A. S., Kuhn, C., Reed, D. R., Tharp, C. D., Slack, J. P., . . . Meyerhof, W. (2005). The molecular basis of individual differences in phenylthiocarbamide and propylthiouracil bitterness perception. *Current Biology*, *15*, 322–327. <http://dx.doi.org/10.1016/j.cub.2005.01.047>
- Bullock, J. G. (2011). Elite influence on public opinion in an informed electorate. *The American Political Science Review*, *105*, 496–515. <http://dx.doi.org/10.1017/S0003055411000165>

- Burke, E. (1987). *Reflections on the revolution in France and on the proceedings in certain societies in London*. London, UK: Printed for J. Dodsley. (Original work published 1790).
- Cantoni, P., Hudson, R., Distel, H., & Laska, M. (1999). Changes in olfactory perception and dietary habits in the course of pregnancy: A questionnaire study. *Chemical Senses*, *24*, 111.
- Chirumbolo, A. (2002). The relationship between need for cognitive closure and political orientation: The mediating role of authoritarianism. *Personality and Individual Differences*, *32*, 603–610. [http://dx.doi.org/10.1016/S0191-8869\(01\)00062-9](http://dx.doi.org/10.1016/S0191-8869(01)00062-9)
- Cichocka, A., & Dhont, K. (2018). The personality bases of political ideology and behavior. In V. Zeigler-Hill & T. K. Shackelford (Eds.), *SAGE handbook of personality and individual differences* (pp. 323–351). London, UK: SAGE. <http://dx.doi.org/10.4135/9781526451248.n14>
- Converse, P. E. (1970). Attitudes and non-attitudes: Continuation of a dialogue. In E. R. Tufté (Ed.), *The quantitative analysis of social problems* (pp. 168–189). Reading, MA: Addison Wesley.
- Converse, P. E. (1976). *The dynamics of party support: Cohort-analyzing party identification*. Beverly Hills, CA: Sage.
- Croy, I., Laqua, K., Süß, F., Joraschky, P., Ziemssen, T., & Hummel, T. (2013). The sensory channel of presentation alters subjective ratings and autonomic responses toward disgusting stimuli—Blood pressure, heart rate and skin conductance in response to visual, auditory, haptic and olfactory presented disgusting stimuli. *Frontiers in Human Neuroscience*, *7*, 510. <http://dx.doi.org/10.3389/fnhum.2013.00510>
- Croy, I., Olgun, S., & Joraschky, P. (2011). Basic emotions elicited by odors and pictures. *Emotion*, *11*, 1331–1335. <http://dx.doi.org/10.1037/a0024437>
- Curtis, V., & Biran, A. (2001). Dirt, disgust, and disease. Is hygiene in our genes? *Perspectives in Biology and Medicine*, *44*, 17–31. <http://dx.doi.org/10.1353/pbm.2001.0001>
- DellaPosta, D., Shi, Y., & Macy, M. (2015). Why do liberals drink lattes? *American Journal of Sociology*, *120*, 1473–1511. <http://dx.doi.org/10.1086/681254>
- De Vries, C. E., & Marks, G. (2012). The struggle over dimensionality: A note on theory and empirics. *European Union Politics*, *13*, 185–193. <http://dx.doi.org/10.1177/1465116511435712>
- Doty, R. L. (Ed.). (2015). *Handbook of olfaction and gustation*. Hoboken, NJ: Wiley. <http://dx.doi.org/10.1002/9781118971758>
- Drayna, D., Coon, H., Kim, U. K., Elsner, T., Cromer, K., Otterud, B., . . . the Utah Genetic Reference Project. (2003). Genetic analysis of a complex trait in the Utah Genetic Reference Project: A major locus for PTC taste ability on chromosome 7q and a secondary locus on chromosome 16p. *Human Genetics*, *112*, 567–572. <http://dx.doi.org/10.1007/s00439-003-0911-y>
- Duckitt, J., & Sibley, C. G. (2009). A dual-process motivational model of ideology, politics, and prejudice. *Psychological Inquiry*, *20*, 98–109. <http://dx.doi.org/10.1080/10478400903028540>
- Duckitt, J., Wagner, C., du Plessis, I., & Birum, I. (2002). The psychological bases of ideology and prejudice: Testing a dual process model. *Journal of Personality and Social Psychology*, *83*, 75–93. <http://dx.doi.org/10.1037/0022-3514.83.1.75>
- Duffy, V. B., Bartoshuk, L. M., Striegel-Moore, R., & Rodin, J. (1998). Taste changes across pregnancy. *Annals of the New York Academy of Sciences*, *855*, 805–809. <http://dx.doi.org/10.1111/j.1749-6632.1998.tb10663.x>
- Dunn, W. (1997). The impact of sensory processing abilities on the daily lives of young children and their families: A conceptual model. *Infants and Young Children*, *9*, 23–35. <http://dx.doi.org/10.1097/00001163-199704000-00005>
- Dunn, W. (2001). The sensations of everyday life: Empirical, theoretical, and pragmatic considerations. *American Journal of Occupational Therapy*, *55*, 608–620. <http://dx.doi.org/10.5014/ajot.55.6.608>
- Duriez, B., Van Hiel, A., & Kossowska, M. (2005). Authoritarianism and social dominance in Western and Eastern Europe: The importance of the sociopolitical context and of political interest and involvement. *Political Psychology*, *26*, 299–320. <http://dx.doi.org/10.1111/j.1467-9221.2005.00419.x>
- Epstein, R. J. (2014, May 2). Liberals eat here. Conservatives eat there. *The Wall Street Journal*. Retrieved from <https://blogs.wsj.com>
- Erikson, R. S., & Tedin, K. L. (2003). *American public opinion*. New York, NY: Longman.
- Evans, G., Heath, A., & Lalljee, M. (1996). Measuring left-right and libertarian-conservative attitudes in the British electorate. *British Journal of Sociology*, *47*, 93–112. <http://dx.doi.org/10.2307/591118>
- Everett, J. A. (2013). The 12 item social and economic conservatism scale (SECS). *PLoS ONE*, *8*, e82131. <http://dx.doi.org/10.1371/journal.pone.0082131>
- Fanelli, D. (2010). “Positive” results increase down the Hierarchy of the Sciences. *PLoS ONE*, *5*, e10068. <http://dx.doi.org/10.1371/journal.pone.0010068>
- Fazio, R. H., Eiser, J. R., & Shook, N. J. (2004). Attitude formation through exploration: Valence asymmetries. *Journal of Personality and Social Psychology*, *87*, 293–311. <http://dx.doi.org/10.1037/0022-3514.87.3.293>
- Fazio, R. H., Pietri, E. S., Rocklage, M. D., & Shook, N. J. (2015). Positive versus negative valence: Asymmetries in attitude formation and generalization as fundamental individual differences. In J. M. Olson & M. P. Zanna (Eds.), *Advances in experimental social psychology* (pp. 97–146). San Diego, CA: Academic Press. <http://dx.doi.org/10.1016/bs.aesp.2014.09.002>
- Federico, C. M., Fisher, E. L., & Deason, G. (2011). Political expertise and the link between the authoritarian predisposition and conservatism. *Public Opinion Quarterly*, *75*, 686–708. <http://dx.doi.org/10.1093/poq/nfr026>
- Federico, C. M., & Goren, P. (2009). Motivated social cognition and ideology: Is attention to elite discourse a prerequisite for epistemically motivated political affinities? In J. T. Jost, A. C. Kay, & H. Thorisdottir (Eds.), *Social and psychological bases of ideology and system justification* (pp. 267–291). New York, NY: Oxford University Press. <http://dx.doi.org/10.1093/acprof:oso/9780195320916.003.011>
- Federico, C. M., Johnston, C. D., & Lavine, H. G. (2014). Context, engagement, and the (multiple) functions of negativity bias. *Behavioral and Brain Sciences*, *37*, 311–312. <http://dx.doi.org/10.1017/S0140525X13002550>
- Feinberg, M., Antonenko, O., Willer, R., Horberg, E. J., & John, O. P. (2014). Gut check: Reappraisal of disgust helps explain liberal-conservative differences on issues of purity. *Emotion*, *14*, 513–521. <http://dx.doi.org/10.1037/a0033727>
- Feldman, S. (2013). Political ideology. In L. Huddy, D. O. Sears, & J. S. Levy (Eds.), *Oxford handbook of political psychology* (pp. 591–626). New York, NY: Oxford University Press. <http://dx.doi.org/10.1093/oxfordhb/9780199760107.001.0001>
- Feldman, S., & Johnston, C. (2014). Understanding the determinants of political ideology: Implications of structural complexity. *Political Psychology*, *35*, 337–358. <http://dx.doi.org/10.1111/pops.12055>
- Fincher, C. L., & Thornhill, R. (2008a). A parasite-driven wedge: Infectious diseases may explain language and other biodiversity. *Oikos*, *117*, 1289–1297. <http://dx.doi.org/10.1111/j.0030-1299.2008.16684.x>
- Fincher, C. L., & Thornhill, R. (2008b). Assortative sociality, limited dispersal, infectious disease and the genesis of the global pattern of religion diversity. *Proceedings of the Royal Society of London, Series B: Biological Sciences*, *275*, 2587–2594. <http://dx.doi.org/10.1098/rspb.2008.0688>
- Fincher, C. L., & Thornhill, R. (2012). Parasite-stress promotes in-group assortative sociality: The cases of strong family ties and heightened

- religiosity. *Behavioral and Brain Sciences*, 35, 61–79. <http://dx.doi.org/10.1017/S0140525X11000021>
- Frenkel-Brunswick, E. (1949). Intolerance of ambiguity as an emotional and perceptual personality variable. *Journal of Personality*, 18, 108–143. <http://dx.doi.org/10.1111/j.1467-6494.1949.tb01236.x>
- Fuchs, D., & Klingemann, H. D. (1990). The left-right schema. In M. K. Jennings & J. W. Van Deth (Eds.), *Continuities in political action* (pp. 203–234). Berlin, Germany: De Gruyter. <http://dx.doi.org/10.1515/9783110882193.203>
- Gabel, M. J., & Hix, S. (2002). Defining the EU political space: An empirical study of the European elections manifestos, 1979–1999. *Comparative Political Studies*, 35, 934–964. <http://dx.doi.org/10.1177/001041402236309>
- Gerber, A. S., Huber, G. A., Doherty, D., Dowling, C. M., & Ha, S. E. (2010). Personality and political attitudes: Relationships across issue domains and political contexts. *The American Political Science Review*, 104, 111–133. <http://dx.doi.org/10.1017/S0003055410000031>
- Gilbert, A. N., & Wysocki, C. J. (1991). Quantitative assessment of olfactory experience during pregnancy. *Psychosomatic Medicine*, 53, 693–700. <http://dx.doi.org/10.1097/00006842-199111000-00009>
- Gillies, J., & Campbell, S. (1985). Conservatism and poetry preferences. *British Journal of Social Psychology*, 24, 223–227. <http://dx.doi.org/10.1111/j.2044-8309.1985.tb00682.x>
- Golec, A. (2002). Need for cognitive closure and political conservatism: Studies on the nature of the relationship. *Polish Psychological Bulletin*, 33, 5–12.
- Haidt, J., McCauley, C., & Rozin, P. (1994). Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors. *Personality and Individual Differences*, 16, 701–713. [http://dx.doi.org/10.1016/0191-8869\(94\)90212-7](http://dx.doi.org/10.1016/0191-8869(94)90212-7)
- Hansen, J. L., Reed, D. R., Wright, M. J., Martin, N. G., & Breslin, P. A. (2006). Heritability and genetic covariation of sensitivity to PROP, SOA, quinine HCl, and caffeine. *Chemical Senses*, 31, 403–413. <http://dx.doi.org/10.1093/chemse/bjj044>
- Hatemi, P. K., Gillespie, N. A., Eaves, L. J., Maher, B. S., Webb, B. T., Heath, A. C., . . . Montgomery, G. W. (2011). A genome-wide analysis of liberal and conservative political attitudes. *The Journal of Politics*, 73, 271–285. <http://dx.doi.org/10.1017/S0022381610001015>
- Hatemi, P. K., Medland, S. E., Klemmensen, R., Oskarsson, S., Littvay, L., Dawes, C. T., . . . Martin, N. G. (2014). Genetic influences on political ideologies: Twin analyses of 19 measures of political ideologies from five democracies and genome-wide findings from three populations. *Behavior Genetics*, 44, 282–294. <http://dx.doi.org/10.1007/s10519-014-9648-8>
- Hayes, A. F. (2012). *PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling*. [White Paper] Retrieved from <http://www.afhayes.com/public/process2012.pdf>
- Hedges, L. V., & Vevea, J. L. (1998). Fixed-and random-effects models in meta-analysis. *Psychological Methods*, 3, 486–504. <http://dx.doi.org/10.1037/1082-989X.3.4.486>
- Helzer, E. G., & Pizarro, D. A. (2011). Dirty liberals! Reminders of physical cleanliness influence moral and political attitudes. *Psychological Science*, 22, 517–522. <http://dx.doi.org/10.1177/0956797611402514>
- Herz, R. S. (2011). PROP taste sensitivity is related to visceral but not moral disgust. *Chemosensory Perception*, 4, 72–79. <http://dx.doi.org/10.1007/s12078-011-9089-1>
- Herz, R. S. (2014). Verbal priming and taste sensitivity make moral transgressions gross. *Behavioral Neuroscience*, 128, 20–28. <http://dx.doi.org/10.1037/a0035468>
- Hibbing, J. R., Smith, K. B., & Alford, J. R. (2014). Differences in negativity bias underlie variations in political ideology. *Behavioral and Brain Sciences*, 37, 297–307. <http://dx.doi.org/10.1017/S0140525X13001192>
- Huber, J., & Inglehart, R. (1995). Expert interpretations of party space and party locations in 42 societies. *Party Politics*, 1, 73–111. <http://dx.doi.org/10.1177/1354068895001001004>
- Inbar, Y., Pizarro, D. A., & Bloom, P. (2009). Conservatives are more easily disgusted than liberals. *Cognition and Emotion*, 23, 714–725. <http://dx.doi.org/10.1080/02699930802110007>
- Inbar, Y., Pizarro, D. A., & Bloom, P. (2012). Disgusting smells cause decreased liking of gay men. *Emotion*, 12, 23–27. <http://dx.doi.org/10.1037/a0023984>
- Inbar, Y., Pizarro, D., Iyer, R., & Haidt, J. (2012). Disgust sensitivity, political conservatism, and voting. *Social Psychological and Personality Science*, 3, 537–544. <http://dx.doi.org/10.1177/1948550611429024>
- Iyengar, S., & Westwood, S. J. (2015). Fear and loathing across party lines: New evidence on group polarization. *American Journal of Political Science*, 59, 690–707. <http://dx.doi.org/10.1111/ajps.12152>
- Jacobs, D., & Carmichael, J. T. (2002). Subordination and violence against state control agents: Testing political explanations for lethal assaults against the police. *Social Forces*, 80, 1223–1251. <http://dx.doi.org/10.1353/sof.2002.0027>
- Jacoby, W. G. (1991). Ideological identification and issue attitudes. *American Journal of Political Science*, 35, 178–205. <http://dx.doi.org/10.2307/2111443>
- Jennings, M. K. (1990). The crystallization of orientations. In *Continuities in political action: A longitudinal study of political orientations in three western democracies* (pp. 313–348). Berlin, Germany: de Gruyter.
- Jennings, M. K., & Markus, G. B. (1984). Partisan orientations over the long haul: Results from the three-wave political socialization panel study. *The American Political Science Review*, 78, 1000–1018. <http://dx.doi.org/10.2307/1955804>
- Johnson, M. K., Rowatt, W. C., & LaBouff, J. P. (2012). Religiosity and prejudice revisited: In-group favoritism, out-group derogation, or both? *Psychology of Religion and Spirituality*, 4, 154–168. <http://dx.doi.org/10.1037/a0025107>
- Jost, J. T. (2006). The end of the end of ideology. *American Psychologist*, 61, 651–670. <http://dx.doi.org/10.1037/0003-066X.61.7.651>
- Jost, J. T., Glaser, J., Kruglanski, A. W., & Sulloway, F. J. (2003a). Political conservatism as motivated social cognition. *Psychological Bulletin*, 129, 339–375. <http://dx.doi.org/10.1037/0033-2909.129.3.339>
- Jost, J. T., Glaser, J., Kruglanski, A. W., & Sulloway, F. J. (2003b). Exceptions that prove the rule: Using a theory of motivated social cognition to account for ideological incongruities and political anomalies: Reply to Greenberg and Jonas (2003). *Psychological Bulletin*, 129, 383–393. <http://dx.doi.org/10.1037/0033-2909.129.3.383>
- Jost, J. T., Sterling, J., & Stern, C. (2018). Getting closure on conservatism, or the politics of epistemic and existential motivation. In C. Kopetz & A. Fishbach (Eds.), *The motivation-cognition interface, from the lab to the real world: A festschrift in honor of Arie W. Kruglanski* (Vol. I, pp. 56–87). New York, NY: Routledge.
- Karinen, A. K., Molho, C., Kupfer, T. R., & Tybur, J. M. (2019). Disgust sensitivity and opposition to immigration: Does contact avoidance or resistance to foreign norms explain the relationship? *Journal of Experimental Social Psychology*, 84, 103817. <http://dx.doi.org/10.1016/j.jesp.2019.103817>
- Kauer, J., Pelchat, M. L., Rozin, P., & Zickgraf, H. F. (2015). Adult picky eating. Phenomenology, taste sensitivity, and psychological correlates. *Appetite*, 90, 219–228. <http://dx.doi.org/10.1016/j.appet.2015.03.001>
- Kemmelmeier, M. (1997). Need for closure and political orientation among German university students. *The Journal of Social Psychology*, 137, 787–789. <http://dx.doi.org/10.1080/00224549709595501>
- Kim, U. K., Jorgenson, E., Coon, H., Leppert, M., Risch, N., & Drayna, D. (2003). Positional cloning of the human quantitative trait locus underlying taste sensitivity to phenylthiocarbamide. *Science*, 299, 1221–1225. <http://dx.doi.org/10.1126/science.1080190>

- Konstantopoulos, S. (2011). Fixed effects and variance components estimation in three-level meta-analysis. *Research Synthesis Methods*, 2, 61–76. <http://dx.doi.org/10.1002/jrsm.35>
- Kossowska, M., & Van Hiel, A. (2003). The relationship between need for closure and conservative beliefs in Western and Eastern Europe. *Political Psychology*, 24, 501–518. <http://dx.doi.org/10.1111/0162-895X.00338>
- Lacazette, E., Pitiot, G., Jobert, S., Mallet, J., & Gachon, A. M. F. (1997). Fine genetic mapping of LCN1/D9S1826 within 9q34. *Annals of Human Genetics*, 61, 449–455. <http://dx.doi.org/10.1017/S0003480097006374>
- Lakens, D., & Etz, A. J. (2017). Too true to be bad: When sets of studies with significant and nonsignificant findings are probably true. *Social Psychological and Personality Science*, 8, 875–881. <http://dx.doi.org/10.1177/1948550617693058>
- Lawless, H. (1980). A comparison of different methods used to assess sensitivity to the taste of phenylthiocarbamide (PTC). *Chemical Senses*, 5, 247–256. <http://dx.doi.org/10.1093/chemse/5.3.247>
- Layman, G. C., & Carsey, T. M. (2002). Party polarization and “conflict extension” in the American electorate. *American Journal of Political Science*, 46, 786–802. <http://dx.doi.org/10.2307/3088434>
- Levendusky, M. (2009). *The partisan sort: How liberals became democrats and conservatives became republicans*. Chicago, IL: University of Chicago Press. <http://dx.doi.org/10.7208/chicago/9780226473673.001.0001>
- Lukes, S. (2003). Epilogue: The grand dichotomy of the twentieth century. In T. Ball & R. Bellamy (Eds.), *The Cambridge history of twentieth-century political thought* (pp. 602–626). Cambridge, UK: Cambridge University Press. <http://dx.doi.org/10.1017/CHOL9780521563543.030>
- Malka, A., & Lelkes, Y. (2010). More than ideology: Conservative–liberal identity and receptivity to political cues. *Social Justice Research*, 23, 156–188. <http://dx.doi.org/10.1007/s11211-010-0114-3>
- Malka, A., Lelkes, Y., & Soto, C. J. (2019). Are cultural and economic conservatism positively correlated? A large-scale cross-national test. *British Journal of Political Science*, 49, 1045–1069. <http://dx.doi.org/10.1017/S0007123417000072>
- Malka, A., & Soto, C. J. (2015). Rigidity of the economic right? Menu-independent and menu-dependent influences of psychological dispositions on political attitudes. *Current Directions in Psychological Science*, 24, 137–142. <http://dx.doi.org/10.1177/0963721414556340>
- Marcus, G. E., Sullivan, J. L., Theiss-Morse, E., & Wood, S. L. (1995). *With malice toward some: How people make civil liberties judgments*. New York, NY: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9781139174046>
- Mayr, E. (1960). The emergence of evolutionary novelties. In S. Tax (Ed.), *evolution after Darwin* (Vol. 1, pp. 349–380). Chicago, IL: University of Chicago Press.
- McCarty, N., Poole, K. T., & Rosenthal, H. (2006). *Polarized America*. Cambridge, MA: MIT Press.
- McClosky, H., & Zaller, J. (1984). *The American ethos*. Cambridge, MA: Harvard University Press. <http://dx.doi.org/10.4159/harvard.9780674428522>
- McCoy, J., Rahman, T., & Somer, M. (2018). Polarization and the global crisis of democracy: Common patterns, dynamics, and pernicious consequences for democratic politics. *American Behavioral Scientist*, 62, 16–42. <http://dx.doi.org/10.1177/0002764218759576>
- McShane, B. B., & Böckenholt, U. (2017). Single-paper meta-analysis: Benefits for study summary, theory testing, and replicability. *Journal of Consumer Research*, 43, 1048–1063. <http://dx.doi.org/10.1093/jcr/ucw085>
- Mikol, B. (1960). The enjoyment of new musical systems. *The open and closed mind* (pp. 270–284). New York, NY: Basic Books.
- Miller, I. J., Jr. (1986). Variation in human fungiform taste bud densities among regions and subjects. *The Anatomical Record*, 216, 474–482. <http://dx.doi.org/10.1002/ar.1092160404>
- Miller, L. J., Anzalone, M. E., Lane, S. J., Cermak, S. A., & Osten, E. T. (2007). Concept evolution in sensory integration: A proposed nosology for diagnosis. *American Journal of Occupational Therapy*, 61, 135–140. <http://dx.doi.org/10.5014/ajot.61.2.135>
- Miller, W. E., & Shanks, J. M. (1996). *The new American voter*. Cambridge, MA: Harvard University Press.
- Mojet, J., Christ-Hazelhof, E., & Heidema, J. (2001). Taste perception with age: Generic or specific losses in threshold sensitivity to the five basic tastes? *Chemical Senses*, 26, 845–860. <http://dx.doi.org/10.1093/chemse/26.7.845>
- Nordin, S., Broman, D. A., Olofsson, J. K., & Wulff, M. (2004). A longitudinal descriptive study of self-reported abnormal smell and taste perception in pregnant women. *Chemical Senses*, 29, 391–402. <http://dx.doi.org/10.1093/chemse/bjh040>
- O’Brien, K., Forrest, W., Lynott, D., & Daly, M. (2013). Racism, gun ownership and gun control: Biased attitudes in U.S. whites may influence policy decisions. *PLoS ONE*, 8, e77552. <http://dx.doi.org/10.1371/journal.pone.0077552>
- Olatunji, B. O. (2008). Disgust, scrupulosity and conservative attitudes about sex: Evidence for a mediational model of homophobia. *Journal of Research in Personality*, 42, 1364–1369. <http://dx.doi.org/10.1016/j.jrp.2008.04.001>
- Olatunji, B. O., Williams, N. L., Tolin, D. F., Abramowitz, J. S., Sawchuk, C. N., Lohr, J. M., & Elwood, L. S. (2007). The Disgust Scale: Item analysis, factor structure, and suggestions for refinement. *Psychological Assessment*, 19, 281–297. <http://dx.doi.org/10.1037/1040-3590.19.3.281>
- Pew Research Center. (2014). *Political polarization in the American public*. Retrieved from <https://www.people-press.org/2014/06/12/political-polarization-in-the-american-public/>
- Pew Research Center. (2016). *Partisanship and political animosity in 2016*. Retrieved from <http://www.people-press.org/2016/06/22/1-feelings-about-partisans-and-the-parties/>
- Pew Research Center. (2017a). *Political typology reveals deep fissures on the right and left*. Retrieved from <https://www.pewresearch.org/politics/2017/10/24/political-typology-reveals-deep-fissures-on-the-right-and-left/>
- Pew Research Center. (2017b). *The partisan divide on political values grows even wider*. Retrieved from <http://www.people-press.org/2017/10/05/the-partisan-divide-on-political-values-grows-even-wider/>
- Rajab, A., Kelberman, D., de Castro, S. C., Biebermann, H., Shaikh, H., Pearce, K., . . . Dattani, M. T. (2008). Novel mutations in LHX3 are associated with hypopituitarism and sensorineural hearing loss. *Human Molecular Genetics*, 17, 2150–2159. <http://dx.doi.org/10.1093/hmg/ddn114>
- Rathbun, B. C. (2007). Hierarchy and community at home and abroad: Evidence of a common structure of domestic and foreign policy beliefs in American elites. *Journal of Conflict Resolution*, 51, 379–407. <http://dx.doi.org/10.1177/0022002707300842>
- Reiljan, A. (2019). ‘Fear and loathing across party lines’ (also) in Europe: Affective polarisation in European party systems. *European Journal of Political Research*. Advance online publication. <http://dx.doi.org/10.1111/1475-6765.12351>
- Roberts, L. (1989). Disease and death in the New World. *Science*, 246, 1245–1247. <http://dx.doi.org/10.1126/science.2479984>
- Roccatò, M., & Ricolfi, L. (2005). On the correlation between right-wing authoritarianism and social dominance orientation. *Basic and Applied Social Psychology*, 27, 187–200. http://dx.doi.org/10.1207/s15324834basp2703_1
- Rolls, E. T., & Scott, T. R. (2003). Central taste anatomy and neurophysiology. In R. L. Doty (Ed.), *Handbook of olfaction and gustation* (pp. 1189–1233). Cleveland, OH: CRC Press.
- Rosas, J. C., & Ferreira, A. R. (2014). Left and right: Critical junctures. In J. C. Rosas & A. R. Ferreira (Eds.), *Left and right: The great dichotomy revisited* (pp. 2–21). Newcastle upon Tyne, UK: Cambridge Scholars Publishing.

- Rozin, P., Haidt, J., & McCauley, C. R. (2008). Disgust. In M. Lewis, J. M. Haviland-Jones & L. F. Barrett (Eds.), *Handbook of emotions* (3rd ed., pp. 757–776). New York, NY: Guilford.
- Ruch, W., & Hehl, F. J. (1986). Conservatism as a predictor of responses to humour: A comparison of four scales. *Personality and Individual Differences*, 7, 1–14. [http://dx.doi.org/10.1016/0191-8869\(86\)90102-9](http://dx.doi.org/10.1016/0191-8869(86)90102-9)
- Saucier, G. (2000). Isms and the structure of social attitudes. *Journal of Personality and Social Psychology*, 78, 366–385. <http://dx.doi.org/10.1037/0022-3514.78.2.366>
- Schaller, M. (2011). The behavioural immune system and the psychology of human sociality. *Philosophical Transactions of the Royal Society of London Series B, Biological Sciences*, 366, 3418–3426. <http://dx.doi.org/10.1098/rstb.2011.0029>
- Schaller, M., & 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. <http://dx.doi.org/10.1037/0022-3514.95.1.212>
- Schneider, J. F. (1985). Authoritarian-conservatism and pleasantness of visual patterns: What determines aesthetic preferences? *The High School Journal*, 68, 389–395.
- Schönbrodt, F. D., & Perugini, M. (2013). At what sample size do correlations stabilize? *Journal of Research in Personality*, 47, 609–612. <http://dx.doi.org/10.1016/j.jrp.2013.05.009>
- Schwartz, S. H., Caprara, G. V., & Vecchione, M. (2010). Basic personal values, core political values, and voting: A longitudinal analysis. *Political Psychology*, 31, 421–452. <http://dx.doi.org/10.1111/j.1467-9221.2010.00764.x>
- Schwartz, S. H., Caprara, G. V., Vecchione, M., Bain, P., Bianchi, G., Caprara, M. G., . . . Mamali, C. (2014). Basic personal values underlie and give coherence to political values: A cross national study in 15 countries. *Political Behavior*, 36, 899–930. <http://dx.doi.org/10.1007/s11109-013-9255-z>
- Sears, D. O. (1975). Political socialization. In F. I. Greenstein & N. W. Polsby (Eds.), *Handbook of political science* (Vol. 2, pp. 93–153). Reading, MA: Addison Wesley.
- Sears, D. O. (1983). The persistence of early political predispositions: The roles of attitude object and life stage. In L. Wheeler & P. Shaver (Eds.), *Review of personality and social psychology* (Vol. 4, pp. 79–116). Beverly Hills, CA: Sage.
- Sears, D. O., & Funk, C. (1999). Evidence of the long-term persistence of adults' political predispositions. *The Journal of Politics*, 61, 1–28. <http://dx.doi.org/10.2307/2647773>
- Sears, D. O., & Levy, S. (2003). Childhood and adult political development. In D. O. Sears, L. Huddy, & R. Jervis (Eds.), *Oxford handbook of political psychology* (pp. 60–109). Oxford, UK: Oxford University Press.
- Shahbake, M., Hutchinson, I., Laing, D. G., & Jinks, A. L. (2005). Rapid quantitative assessment of fungiform papillae density in the human tongue. *Brain Research*, 1052, 196–201. <http://dx.doi.org/10.1016/j.brainres.2005.06.031>
- Sherkat, D. E., Powell-Williams, M., Maddox, G., & de Vries, K. M. (2011). Religion, politics, and support for same-sex marriage in the United States, 1988–2008. *Social Science Research*, 40, 167–180. <http://dx.doi.org/10.1016/j.ssres.2010.08.009>
- Sibley, C. G., & Duckitt, J. (2008). Personality and prejudice: A meta-analysis and theoretical review. *Personality and Social Psychology Review*, 12, 248–279. <http://dx.doi.org/10.1177/1088868308319226>
- Sibley, C. G., Osborne, D., & Duckitt, J. (2012). Personality and political orientation: Meta-analysis and test of a Threat-Constraint Model. *Journal of Research in Personality*, 46, 664–677. <http://dx.doi.org/10.1016/j.jrp.2012.08.002>
- Skitka, L. J. (1999). Ideological and attributional boundaries on public compassion: Reactions to individuals and communities affected by a natural disaster. *Personality and Social Psychology Bulletin*, 25, 793–808. <http://dx.doi.org/10.1177/0146167299025007003>
- Skitka, L. J., & Tetlock, P. E. (1993a). Providing public assistance: Cognitive and motivational processes underlying liberal and conservative policy preferences. *Journal of Personality and Social Psychology*, 65, 1205–1223. <http://dx.doi.org/10.1037/0022-3514.65.6.1205>
- Skitka, L. J., & Tetlock, P. E. (1993b). Of ants and grasshoppers: The political psychology of allocating public assistance. In B. Mellers & J. Baron (Eds.), *Psychological perspectives in justice* (pp. 205–233). New York, NY: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511552069.011>
- Smith, K. B., Oxley, D. R., Hibbing, M. V., Alford, J. R., & Hibbing, J. R. (2011). Linking genetics and political attitudes: Reconceptualizing political ideology. *Political Psychology*, 32, 369–397. <http://dx.doi.org/10.1111/j.1467-9221.2010.00821.x>
- Stenner, K. (2005). *The authoritarian dynamic*. London, UK: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511614712>
- Sterling, J., Jost, J. T., & Pennycook, G. (2016). Are neoliberals more susceptible to bullshit? *Judgment and Decision Making*, 11, 352–360.
- Stern, R. M., Koch, K. L., & Andrews, P. (2011). *Nausea: Mechanisms and management*. New York, NY: Oxford University Press.
- Tepper, B. J. (2008). Nutritional implications of genetic taste variation: The role of PROP sensitivity and other taste phenotypes. *Annual Review of Nutrition*, 28, 367–388. <http://dx.doi.org/10.1146/annurev.nutr.28.061807.155458>
- Terrizzi, J. A., Jr., Shook, N. J., & McDaniel, M. A. (2013). The behavioral immune system and social conservatism: A meta-analysis. *Evolution and Human Behavior*, 34, 99–108. <http://dx.doi.org/10.1016/j.evolhumbehav.2012.10.003>
- Terrizzi, J. A., Shook, N. J., & Ventis, W. L. (2010). Disgust: A predictor of social conservatism and prejudicial attitudes toward homosexuals. *Personality and Individual Differences*, 49, 587–592. <http://dx.doi.org/10.1016/j.paid.2010.05.024>
- Tetlock, P. E., Visser, P. S., Singh, R., Polifroni, M., Scott, A., Elson, S. B., . . . Rescober, P. (2007). People as intuitive prosecutors: The impact of social-control goals on attributions of responsibility. *Journal of Experimental Social Psychology*, 43, 195–209. <http://dx.doi.org/10.1016/j.jesp.2006.02.009>
- Thornhill, R., Fincher, C. L., & Aran, D. (2009). Parasites, democratization, and the liberalization of values across contemporary countries. *Biological Reviews of the Cambridge Philosophical Society*, 84, 113–131. <http://dx.doi.org/10.1111/j.1469-185X.2008.00062.x>
- Tomchek, S. D., & Dunn, W. (2007). Sensory processing in children with and without autism: A comparative study using the short sensory profile. *American Journal of Occupational Therapy*, 61, 190–200. <http://dx.doi.org/10.5014/ajot.61.2.190>
- Tomkins, S. (1963). Left and right: A basic dimension of ideology and personality. In R. W. White (Ed.), K. F. Bruner (Collaborator), *The study of lives: Essays on personality in honor of Henry A. Murray* (pp. 388–411). New York, NY: Atherton Press. <http://dx.doi.org/10.1037/12238-017>
- Tybur, J. M., Inbar, Y., Aarøe, L., Barclay, P., Barlow, F. K., de Barra, M., . . . Žeželj, I. (2016). Parasite stress and pathogen avoidance relate to distinct dimensions of political ideology across 30 nations. *Proceedings of the National Academy of Sciences of the United States of America*, 113, 12408–12413. <http://dx.doi.org/10.1073/pnas.1607398113>
- Tybur, J. M., Inbar, Y., Güler, E., & Molho, C. (2015). Is the relationship between pathogen avoidance and ideological conservatism explained by sexual strategies? *Evolution and Human Behavior*, 36, 489–497. <http://dx.doi.org/10.1016/j.evolhumbehav.2015.01.006>
- Tybur, J. M., Lieberman, D., Kurzban, R., & DeScioli, P. (2013). Disgust: Evolved function and structure. *Psychological Review*, 120, 65–84. <http://dx.doi.org/10.1037/a0030778>

- Tyler, T. R., & Weber, R. (1982). Support for the death penalty; instrumental response to crime, or symbolic attitude? *Law & Society Review*, *17*, 21–45. <http://dx.doi.org/10.2307/3053531>
- Verdant Labs. (2016). *Democratic versus republican occupations*. Retrieved from http://verdantlabs.com/politics_of_professions/
- Vytal, K., & Hamann, S. (2010). Neuroimaging support for discrete neural correlates of basic emotions: A voxel-based meta-analysis. *Journal of Cognitive Neuroscience*, *22*, 2864–2885. <http://dx.doi.org/10.1162/jocn.2009.21366>
- Whitley, B. B., Jr. (1999). Right-wing authoritarianism, social dominance orientation, and prejudice. *Journal of Personality and Social Psychology*, *77*, 126–134. <http://dx.doi.org/10.1037/0022-3514.77.1.126>
- Wiesehomeier, N., & Benoit, K. (2009). Presidents, parties, and policy competition. *The Journal of Politics*, *71*, 1435–1447. <http://dx.doi.org/10.1017/S0022381609990193>
- Wilson, G. D. (1973). *The psychology of conservatism*. Oxford, England: Academic Press.
- Wilson, G. D., Ausman, J., & Mathews, T. R. (1973). Conservatism and art preferences. *Journal of Personality and Social Psychology*, *25*, 286–288. <http://dx.doi.org/10.1037/h0033972>
- Yakovlev, P. A., & Guessford, W. P. (2013). Alcohol consumption and political ideology: What's party got to do with it? *Journal of Wine Economics*, *8*, 335–354. <http://dx.doi.org/10.1017/jwe.2013.23>
- Zaller, J., & Feldman, S. (1992). A simple theory of the survey response: Answering questions versus revealing preferences. *American Journal of Political Science*, *36*, 579–616. <http://dx.doi.org/10.2307/2111583>
- Zuniga, J. R., Davis, S. H., Englehardt, R. A., Miller, I. J., Jr., Schiffman, S. S., & Phillips, C. (1993). Taste performance on the anterior human tongue varies with fungiform taste bud density. *Chemical Senses*, *18*, 449–460. <http://dx.doi.org/10.1093/chemse/18.5.449>

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