

Gender and Physiological Effects in Connecting Disgust to Political Preferences*

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Social Science Quarterly

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This is the author's manuscript of the article published in final edited form as:

Balzer, A., & Jacobs, C. M. (2011). Gender and Physiological Effects in Connecting Disgust to Political Preferences. *Social Science Quarterly*, 92(5), 1297–1313. Available from: <http://dx.doi.org/10.1111/j.1540-6237.2011.00819.x>

Abstract: Objectives: Sensitivity to disgust predicts social attitudes, but this relationship can shift depending on gender and whether response to disgust is measured through surveys or physiological tests. We are interested in exploring the relationship between gender, political preferences and different measures of disgust. **Methods:** We systematically evaluate these interrelationships by comparing self-reported disgust sensitivity and changes in skin conductance while viewing disgusting images, accounting for gender and attitudes toward gay marriage. **Results:** We find that, though there is no physiological difference between genders, opponents of gay marriage conform to gender role expectations in self-reports, with women reporting higher levels of disgust than males. For males, physiological response better predicts attitudes on gay marriage because there are physiological, but not self-reported, differences between supporters and opponents. Self-report and physiology both predict gay marriage attitudes for females. **Conclusions:** Our findings suggest that combining traditional survey and physiological measures provides leverage in exploring questions related to social behaviors and their origins.

Whether explained by theories of evolutionary psychology or the forces of socialization, scholars have long been interested in exploring the emotions that motivate action as well as gender differences in the propensity to experience and express those emotions. Political scientists have traditionally relied on self-report data to explore individual-level differences that underlie political attitudes and behavior in spite of well-known weaknesses like vulnerability to social desirability biases and the inability of people to effectively evaluate or communicate their attitudes and experiences (Cacioppo et al., 2007). Recently, promising technology and methodology have been imported from psychophysiology, allowing political scientists to build on the base of knowledge established by survey research while providing a more nuanced view of political behavior. Psychological states can be inferred from physiological data without the biases inherent in self-report measures (Bradley and Lang, 2007; Cacioppo et al., 2007; Smith and Hibbing, 2011) because specific non-conscious changes in physiology correspond to emotional states (Cacioppo et al., 2007).

A clear opportunity to gain knowledge from the use of physiology can be found in research on disgust sensitivity, gender, and political attitudes. Both self-reported measures of disgust and physiological responses to disgusting stimuli are associated with political ideology and more specific attitudes on homosexuality (Inbar et al., 2009a; Inbar et al., 2009b; Smith et al., 2009; Terrizzi et al., 2010). However, links between gender and disgust sensitivity suggest a more complicated picture. Women repeatedly report higher sensitivity to disgust than men but physiological responses to disgusting stimuli are very similar across gender (Kring and Gordon, 1998; Rohrman et al., 2008; Stark et al. 2005). In spite of the fact that disgust sensitivity, gender, and political ideology all appear to be interconnected, there has been no systematic examination of the relationships between these variables. We leverage the advantages of a data set that includes both self-reports and physiological measures of disgust sensitivity and, after including gender and political attitudes, uncover a considerably more complex pattern than self-report data alone would suggest. Used together, self-

report and physiology allow political scientists to take a powerful new look at the biological and social factors that underlie important political attitudes and behaviors and that is what we seek to do here.

Disgust: Theory and Measurement

Disgust has been characterized as a fundamental emotion linked to the evolutionary need to avoid environmental pathogens and toxic substances (Ekman, 1999; Oaten et al., 2009; Olatunji and Sawchuk, 2005; Olatunji et al., 2008; Rozin et al., 2000; Schienle et al., 2001). At a basic level, disgust functions as the “guardian of the mouth” (Olatunji and Sawchuk, 2005, 935) and serves as a food- or contaminant-rejection mechanism to avoid disease (Rozin et al., 1999; Rozin et al., 2000). The focus on food and oral contamination is a defining feature of core disgust, one of several different categories of the disgust emotion (Haidt et al., 1994; Olatunji et al., 2008; Rozin et al., 2000; Rozin et al., 1999). While feelings of disgust may arise to keep us from ingesting contaminants, they also surface in response to violations of the body envelope, deviant sexual behavior, and poor hygiene (Haidt et al., 1994; Rozin et al., 1999). As a result, disgust readily applies to moral situations (Olatunji and Sawchuk, 2005; Rozin et al., 2000) and can have a significant influence on judgments of social behaviors because of its link to disease avoidance and purity concerns (Graham et al., 2009; Haidt et al., 1994; Schaller and Duncan, 2007; Terrizzi et al., 2010). In fact, scholars suggest the primary motivations behind interpersonal and moral disgust are to protect the soul and the social order (Olatunji and Sawchuk, 2005; Rozin et al., 2000).

Conceptualized as a part of a “behavioral immune system” (Schaller and Duncan, 2007), feelings of disgust induce avoidance behaviors by serving as indicators that a particular situation or individual may be a source of disease, increasing the likelihood of bodily contamination. This is consistent with research linking disgust sensitivity to negative attitudes about social outgroups (Faulkner et al., 2004; Navarrete and Fessler, 2006) as well as social conservatism more generally

(Inbar et al., 2009; Terrizzi et al., 2010). Also, feelings of disgust are often reported in response to various sexual practices and have been associated with negative attitudes toward homosexuality and gay marriage (Inbar et al., 2009b; Smith et al., 2009; Terrizzi et al., 2010). Rozin et al. (2000) argue that this socio-moral disgust plays an important role as a means of socialization as it attaches to behaviors and creates a negative moral value (i.e. as smoking becomes morally unacceptable, disgust in response to smoking behavior increases; see also Olatunji and Sawchuk, 2005).

In terms of political ideology, conservatives seem to be more sensitive to disgust than liberals, based on self-reports (Inbar et al., 2009a; Terrizzi et al., 2010) as well as physiological measures of response to disgusting stimuli (Smith et al., 2009). Liberals and conservatives also differ in terms of the innate psychological intuitions upon which they rely to make moral judgments (Graham et al. 2009). Unlike liberals, conservatives place considerable emphasis on purity and pollution concerns, which are strongly linked to feelings of disgust. In terms of issues of sexual morality, conservatives rely heavily on “ethics of community” and “ethics of divinity” to explain their opposition to sexual behaviors that could be viewed as deviant (Haidt and Hersh, 2001, 206-207). Emphasis among conservatives on these two types of ethics indicates a focus on preventing societal decay and protecting purity by encouraging the “proper use of the human body” (208). Given that ideological conservatives seem to prioritize purity, which can easily yield disgust if violated by a particular individual or behavior, it is clear that the relationship between ideology and disgust responses requires continued investigation.

Self-Reported Disgust Sensitivity. Self-report measures are commonly used to ascertain the degree to which individuals are sensitive to the various dimensions of disgust. One of the most widely used batteries is the Disgust Sensitivity Survey, developed by Haidt and colleagues (Haidt et al., 1994), where disgust sensitivity is measured by questions like, “Even if I was hungry, I would not drink a bowl of my favorite soup if it had been stirred by a used but thoroughly washed flyswatter.” These

self-reports have reliably correlated with personality traits like neuroticism (Druschel and Sherman, 1999; Haidt et al., 1994; Olatunji et al., 2008), attitudes about homosexuality and other sexual behavior (Inbar et al., 2009b), and participation in behaviors with a disgust component (see e.g. Navarrete and Fessler, 2006; Olatunji and Sawchuk, 2005; Olatunji et al., 2008).

A consistent finding across the literature on disgust is that men and women report significantly different mean levels of disgust sensitivity. Women almost always report that they are more sensitive to disgust than men (Haidt et al., 1994; Rohrmann et al., 2008). One explanation for this gender gap in disgust sensitivity focuses the evolutionary functions of the disgust emotion as a mechanism for protecting reproductive fitness. Females may have faced greater penalties if a selected mate was a close relative (Fessler and Navarrete, 2003) or was unable to help with the care of offspring because of disability, death due to disease (Oaten et al., 2009). Females would also be charged with protecting offspring from disease (Curtis et al., 2004), which combined with mate-fitness concerns, makes women more sensitive to disgust as an indicator of an unfit mate or pathogens in the environment. Conversely, males may be inclined to report lower levels of disgust sensitivity as a demonstration of their strength and fitness (Oaten et al., 2009).

Given the strong cross-cultural durability of disgust reactions (Ekman, 1999; Rozin et al., 1999), human predispositions developed through selection pressure likely shape our responses to things that wrinkle our noses and make us nauseous. However, this evolutionary explanation makes the assumption that the gender gap in self-report accurately reflects a more fundamental difference in evolved sensitivity to disgust. An alternate account for the gender gap suggests that men and women experience disgust similarly but conform to stereotypical gender role expectations when it comes to expressing that disgust (Brody and Hall, 2000; Rohrmann et al., 2008).

Long-standing gender role expectations about appropriate attitudes and behaviors for men and women have centered on expressing emotion (Fischer, 1993; Grossman and Wood, 1993) where the

fundamental distinction between genders is that women are emotional and expressive while men are stoic and inexpressive (Shields, 2002). Women are widely believed to experience and express a variety of emotions, including disgust, to a greater degree than men (Brody, 1997; Hess et al., 2000; Grossman and Wood, 1993; Kring and Gordon, 1998; Plant et al., 2000). Men, on the other hand, tend to internalize emotion and suppress reaction, which “indicates powerful control over instable situations” (Rohrman et al., 2008, 73; see also Brody and Hall, 2000). It is simply expected that women will express the emotions they experience, and it is more socially acceptable for them to do so. Interestingly, the more men and women endorse stereotypical beliefs about sex differences in emotionality, the more their self-reports of emotional experiences tend to match those stereotypes (i.e. strong female endorsers report heightened emotional experiences while strong male endorsers report more restrained responses; Grossman and Wood, 1993).

From this perspective, it is not surprising that self-reported disgust sensitivity shows consistent gender effects, as a lower sensitivity to disgust is socially desirable for men who are supposed to keep their feelings to themselves. For women, increased expression of disgust is the expected response both because they are supposed to be more emotional in general and because gender roles suggest that they should be more sensitive to those sorts of things. We expect not only that our data will continue to reflect this gap in self-reported disgust sensitivity between men and women, but that gender plays a fundamental role in understanding how disgust connects to political attitudes.

Physiological Responses to Disgust. When individuals encounter something disgusting in their environment, there are specific patterns of physiological arousal associated with disgust that result from the activation of the sympathetic nervous system, including a deceleration in heart rate, an increase in skin conductance, and electromyographic activation in the muscle groups responsible for creating the classic facial expression associated with disgust (Kreibig, 2010; Levenson et al., 1990; Schienle et al., 2001; Stark et al., 2005). Essentially, the body is readying itself for action in response

to the stimuli that triggered the disgust emotion (Cacioppo et al., 2007). Importantly, while self-report data on disgust sensitivity has repeatedly indicated that women are more sensitive to disgust than men, physiological indicators of experienced disgust do not clearly or reliably differentiate between men and women (Smith et al., 2009; Rohrmann et al. 2008; Stark et al., 2005). The limited evidence for gender differences in physiological response is tenuous in terms of statistical significance and fails to replicate across studies (Kring and Gordon, 1998; Rohrmann et al., 2008). For the most part, it seems that for feelings of disgust, the pattern of gender differences found in self-reports does not appear in non-conscious changes in the body.

Using physiology as a measure of emotion rests on the notion that psychological states are biologically instantiated (Cacioppo et al., 2007; Smith and Hibbing, 2011). In other words, there are measurable physical manifestations of emotions like fear, disgust, or happiness (Bradley and Lang, 2007; Kreibig, 2010). The autonomic nervous system (ANS) is responsible for translating psychological states that arise in response to emotional stimuli into non-conscious bodily changes that allow for an appropriate physical response (Cacioppo et al., 2007). As a result, a psychological state or experience of emotion can be inferred from the physiological response that accompanies exposure to a particular stimulus in the environment. Physiological measures of emotion have a key advantage over self-reports because they provide measures of “non-conscious and non-reportable” responses (Cacioppo et al., 2007, 2). This allows researchers to bypass difficulties associated with self-report methods where responses are vulnerable to social desirability effects and helps offset the inability of individuals to accurately consider and report on their emotional states or foundational predispositions (Cacioppo et al., 2007).

Physiological measures of ANS activation have already been used to investigate socially sensitive subjects like racial attitudes (Vanman et al., 2004) but these important methodological tools have only been employed by a handful of political scientists to date (Mutz, 2007; Gruszczyński et al.,

2010; Oxley et al., 2008; Smith et al., 2009). In spite of limited use in the discipline, this technology has proven to be quite useful in addressing questions with profound political implications. For example, individuals who have a stronger physiological response to threatening stimuli tend to endorse socially protective issue attitudes (Oxley et al., 2008), and people who are more physiologically reactive tend to participate more (Gruszczyński et al., 2010)

Looking at disgust specifically, we have evidence that using technology to measure physiological responses to environmental stimuli has given political scientists important insights. Smith et al. (2009) find that *both* higher self-reported disgust sensitivity and increased physiological responses to disgusting stimuli correspond to political conservatism and opposition to gay marriage. Importantly, the self-report measures of disgust are not statistically significantly correlated with the physiological measures but both are independent and significant predictors of opposition to gay marriage. As Smith et al. (2009) note, this illustrates that physiological measures make a contribution to understanding the link between disgust and political attitudes beyond the information provided by self-reports.

For political scientists, using new technology and incorporating physiological measures does not replace more traditional survey or self-report measures. Rather, it provides a way of gathering formerly inaccessible information about political attitudes and behaviors as well as better accounting for biases like gender role expectations that seep into self-report measures. Conversely, uncovering differences between self-report and physiology may help us investigate the nature of socialization and its power over behavior and attitudes. Our findings, reported below, reinforce the notion that it is crucial to incorporate new methodological techniques to fully understand the patterns of interactions between variables like gender, political ideology, and issue attitudes.

Hypotheses

While it seems clear that self-reported disgust sensitivity, physiological responses to disgust, political attitudes, and gender all operate together, no previous work has systematically evaluated the relationships between them. First, given that self-reported sensitivity to disgust shows consistent differences between men and women while physiological measures are far less contingent on gender, we expect that our results will replicate previous work. It is important to note that Smith et al. (2009) address potential gender differences in self-reported disgust sensitivity as a possible explanation for the lack of correlation between their self-report and physiological measures, but they do not specifically examine the effect of gender as it relates to various measures of disgust and other political attitudes.

Hypothesis 1 (replication): Women will report higher levels of disgust sensitivity as compared to men, but there will be no difference in physiological response.

Second, we expect a unique pattern of results when comparing measures of self-reported disgust sensitivity with physiological indicators of disgust in the context of gender and support for gay marriage. After we account for issue preference, we expect female gay marriage opponents to report higher levels of disgust and to exhibit higher physiological response than supporters because previous findings indicate conservatives have higher physiological responses than liberals (Oxley et al., 2008), and self-reports by conservative women will be more likely to conform to gender role expectations (Grossman and Wood, 1993). In this way, the intercept for female gay marriage opponents will be higher than supporters on both disgust measures, but the slope, or mean difference between the two, will be similar. Conversely, males who oppose gay marriage will exhibit the same higher physiological response to disgust as female opponents but their self-report will be much lower as they draw upon traditional expectations of male toughness and low emotionality (Brody, 1997; Brody and Hall, 2000; Rohrmann et al., 2008). Finally, we expect male and female gay marriage supporters to have similar levels of physiological response, lower than that of opponents,

but female supporters will report higher levels of disgust than male supporters as we expect gender socialization to continue to exert some influence on self-reports regardless of ideological predisposition.

Hypothesis 2: There will be a three-way interaction between preferences for gay marriage, gender and type of disgust stimuli in sensitivity to disgust that conforms to the pattern of relationships described above.

Finally, we expect the predictive utility of self-reported disgust versus physiological response to be different for men and women. We know that men tend to internalize experiences of dysphoric emotions like disgust (Brody, 1997) and suppression of these emotions generally tends to enhance physiological responses (Gross and Levenson, 1993). As a result, physiological response to disgust should be a more useful measure for men when predicting attitudes toward gay-marriage because it bypasses issues of social desirability associated with expressing emotions externally and provides a more accurate measure of the emotional experience that is occurring underneath the surface. Conversely, self-report measures should be more accurate for women who are free to express their feelings of disgust and who tend to effectively externalize their emotional experiences (Brody, 1997).

Hypothesis 3: For women, self-reported disgust will be a better predictor of support for gay marriage than physiological response to disgusting images. For men, physiological response will be a better predictor than self-report.

Methods and Results

A professional survey organization was contracted to randomly contact individuals in or near a medium-sized U.S. city, and 200 participants were recruited to complete a computer-based survey on a nearby college campus during the summer of 2007. From this pool of subjects, 51 participants were invited back in the summer of 2008 to complete another survey as well as physiological tests.

Based upon their responses to the 2007 survey questions, participants were recruited across the

range of the politically disinterested to those who were engaged in politics and were paid \$50 for each visit. Our sample is 55% female with an average age of 41.22 (SD=8.26) and modal income of \$20,000 to \$40,000 and modal education of “some college.” Participants willing to engage in this type of research may represent a certain subset of the population and not be broadly generalizable, but our sample does demonstrate variance on the key variables in our study, which will be detailed below.

For the physiological portion of the study, individuals entered the physiology lab, one at a time, and were shown a series of still images for 12 seconds each, interspersed with inter-stimulus intervals (ISI) of a blank screen with a plus sign. The order of images was randomly selected, and each participant viewed the same sequence. Image content ranged from positive (bowl of fruit, bunny rabbit) to negative (vomit, an emaciated body). Skin conductance level (SCL) was collected from participants using a pair of Ag/AgCl electrodes attached to the distal phalanges (fingertips) of the index and middle fingers to measure activation of the sympathetic nervous system (SNS). Essentially, as participants are presented with a stimulus that evokes a sympathetic response, moisture is secreted through skin glands to assist with thermoregulation, making the skin more conductive to electricity (Dawson et al., 2007). Thus, higher SCL indicates sympathetic activity related to various psychological states, including arousal and emotion. In this case, we expect SCL to index experienced disgust because disgusting stimuli are associated with activation of the SNS (Kreibig, 2010; Schienle et al., 2001; Stark et al., 2005)

One of the key dependent variables of disgust sensitivity was derived from SCL change when viewing disgusting stimuli. Three images (a person eating worms, an emaciated body and human excrement in a toilet) were selected using the ratings of an independent sample of 126 participants, who indicated these images were highly negative and elicited strong reactions of disgust. The mean SCL responses to each of these images were logged to normalize the data and divided by the logged

mean SCL measured during the previous (ISI) for each image. A positive score indicates an individual's skin conductance increased when presented with disgusting stimuli, as compared to baselines during the ISI. To avoid misleading results due to extreme values, individual outliers on the three measures were winsorized (setting the highest and lowest values to the 25th and 75th quartile values). The measures of response for the three images were combined into an average that represents overall physiological sensitivity to disgust ($M=-.002$, $SD=.007$) and standardized as z scores to facilitate comparison between key variables.

The second measure of disgust sensitivity is the 25-item DS-R survey (Haidt et al., 1994, modified by Olatunji et al. 2007), in which individuals were able to report the extent to which items like the following are disgusting: “I never let any part of my body touch the toilet seat in public restrooms” or “You take a sip of soda, and then realize that you drank from the glass that an acquaintance of yours had been drinking from.” Scores ranged from 1 (“not disgusting at all”) to 5 (“extremely disgusting”). The total battery captures three sub-factors – core, contamination, and animal reminder – which have been linked to physiological responses (Olatunji et al., 2008). For our analysis, we selected five items (including the two examples mentioned above) that related to core or contamination disgust, as these are more correlated with political preferences (Olatunji et al., 2008; Smith et al., 2009). The items were averaged together and winsorized for outliers ($M=1.30$, $SD=.68$). Z scores were created so that both self-reported and physiological disgust sensitivity had comparable scaling. Though capturing the same emotion, the two measures are not correlated with each other ($r=-.15$; $p=.32$).

It is important to note that while we evaluate the connection between disgust sensitivity and attitudes about a specific issue area—gay marriage—we do not use images of same-sex couples to do so. In accordance with previous research linking both self-reported and physiological disgust measures to attitudes about homosexuality (e.g. Inbar et al., 2009b; Smith et al., 2009), our measure

is indicative of an overall sensitivity to disgust in the environment or the tendency to “experience disgust frequently and readily” (Inbar et al., 2009b, 435). Using a general disgust measure provides a stronger test of our hypothesis. We would expect those who oppose gay marriage to react to homosexual images, but such a finding is not particularly illuminating. Our focus is not on whether those who oppose gay marriage have an unconscious, physiological response to gay intimacy (they most likely do). Our focus is on testing whether the demonstrated link between moral social judgments and disgust sensitivity (Olatunji and Sawchuk, 2005) holds up when the measure of disgust sensitivity is an observed physiological variable rather than a self-report. .

To measure political attitudes, a dichotomous measure of agreement or disagreement with gay marriage was coded 0 for agree, or the liberal position, and 1 for disagree, or the conservative position. Before testing the three-way interaction, separate 2x2 factorial ANOVAs were performed on physiological and self-reported disgust sensitivity. Table 1 displays mean disgust sensitivity by gender and support or opposition to gay marriage. The overall physiology model is significant ($F(3, 43)=3.42$; $MSe=.91$; $p=.03$), and there is a main effect for support for gay marriage ($F=9.55$; $p=.004$), as those who oppose gay marriage demonstrate higher physiological responses to disgusting images than those who support gay marriage. This effect is misleading, however, as follow-up analyses of simple effects show that it only holds for men, as male gay marriage opponents have a higher mean than male gay marriage supporters ($LSD_{mmd}=.82$). There was no mean difference between female supporters and opponents of gay marriage. In other words, male opponents to gay marriage are driving the main effect of the relationship between issue preference and physiological response to disgusting images.

Also in Table 1, an ANOVA of self-reported disgust by gender and support for gay marriage ($F(3, 40)=3.01$; $MSe=.91$; $p=.04$) revealed main effects for gender ($F=7.42$; $p=.01$), supporting our first hypothesis. Follow-up analyses show that this effect only holds for opponents of gay marriage,

as women who oppose gay marriage report higher disgust sensitivity than male opponents (LSD_{mmd}=.82), and there is no mean difference between men and women who support gay marriage. In this instance, female opponents of gay marriage report high enough levels of disgust to create a significant difference between men and women. Figure 1 displays the relationship of these effects for physiology and self-reported disgust.

[Table 1 about here.]

[Figure 1 about here.]

The above analysis and graphical representation suggest there may be a three-way interaction occurring that can only be tested by combining the types of disgust sensitivity into one analysis. A dependent variable of standardized disgust sensitivity was generated by stacking the data so that each participant has two values within this variable: physiological and self-reported sensitivity. This doubles the sample but uses a dichotomous disgust measurement variable to distinguish the type of measure by coding 0 for self-report and 1 for physiology. For example, the data entries for participant #1234 would be:

ID	Disgust sensitivity	Disgust measure
1234	.11	0
1234	.05	1

A 2 (disgust measurement type) x 2 (support for gay marriage) x 2 (gender) factorial ANOVA was performed on disgust sensitivity, resulting in the means reported in Table 1. The overall model was significant ($F(7, 83)=2.76$; $MSe=.91$; $p=.01$), though the 3-way interaction between gender, support for gay marriage and disgust type was not significant ($F=.48$; $p=.50$). A second part of our hypothesis was that there would be an interaction between gender and measure of disgust in predicting sensitivity. The main effect of this 2-way interaction was significant ($F=5.65$; $p=.02$), and follow-up analyses revealed that this relationship only holds for men, as physiological

response to disgust is greater than self-reported disgust ($LSD_{mmd}=.56$). The mean difference of .44 for women between self-report and physiology does not exceed the minimum, but it is in the opposite direction of men. The substantial effect size ($r=.31$) indicates a power problem for the analysis on females, as a larger sample would be needed to achieve significance. The significant result for males and the trending result for females both support our replication hypothesis that disgust sensitivity between men and women will differ depending on how it is measured.

Paring down the analysis further to include support for gay marriage, the 2-way interaction between gender and disgust measurement is only descriptive for male opponents of gay marriage as the self-report/physiology difference exceeds the minimum ($LSD_{mmd}=.81$). There is no mean difference in disgust sensitivity, by measure, for the other three groups, though there are medium effect sizes for female opponents ($r=.24$) and female supporters ($r=.42$), indicating insufficient power in this analysis. In summary, our second hypothesis is partially supported in that male opponents to gay marriage report significantly lower levels of disgust as compared to their actual physiological response to disgusting stimuli, and with a larger sample size, it is likely females would demonstrate a significant difference in disgust sensitivity depending on the measurement.

Disgust Measurement as Predictor of Political Attitudes

We know that gender and ideology are related to disgust sensitivity, depending on how it is measured, but is there such a thing as a “correct” measure when examining political preferences? We hypothesize that self-reported disgust will better predict these attitudes for women but the opposite will be true for men. To test this, we ran a series of nested models on our data, split by gender, with the full model including self-reported disgust, physiological response to disgusting images, age, and education level. The reduced model dropped self-reported disgust. The dependent variable is a continuous attitude measure of whether participants strongly disagree to strongly agree with a constitutional ban on gay marriage, with higher scores indicating the more conservative position

($M=2.61$, $SD=1.55$). Results are displayed in Table 2. The full models for both genders and the reduced model for men are significant at least at .10, and there is no significant difference between the full and reduced model for men (R^2 change=.00; $p=.93$). As hypothesized, physiological disgust sensitivity is predictive of male attitudes on a gay marriage ban, with higher sensitivity corresponding with more agreement with the ban ($p=.01$ in the full and reduced models). Self-reported disgust has no relationship with gay marriage attitudes in men ($p=.93$), and the model does not suffer when this variable is dropped in the reduced version. The fact that our physiological measure of disgust is solely responsible for explaining attitudes toward gay-marriage among men highlights the importance of going beyond self-reports. Men may indeed report that they are relatively insensitive to disgusting environmental stimuli but the non-conscious response from their sympathetic nervous system suggests otherwise, indicating that disgust does drive attitudes for males.

For women, the full model is more predictive. The reduced model is not significant ($F=.55$; $p=.65$), and it is significantly different from the full model (R^2 change=-.23; $p=.01$). In the full model, higher scores on self-reported disgust ($p=.01$) and higher levels of physiological response to disgust ($p=.11$) correspond to more agreement with a gay marriage ban. Though the latter coefficient and the overall model fit do not reach traditional significance levels at .05, the relationship is quite strong considering a sample size of 27. A power analysis revealed a large effect size ($r = .55$), indicating an increased sample should produce a significant model. These results support our hypothesis that self-reported disgust better differentiates female opponents and supporters of gay marriage as opponents will be more likely to conform to traditional gender role expectations regarding reported sensitivity to disgust, and this effect will be greater than physiological differences.

Discussion

Connecting disgust and attitudes toward gay marriage, the effects of gender expectations and disgust sensitivity contributes to the bridges being built between genetics, biology, environmental influences and subsequent political behavior (Smith et al., 2011). Even with a relatively limited sample size, our analysis reveals that uncovering the differences between survey methods and physiological response to stimuli can have important implications for political scientists. We are eager for continued research that takes advantage of these new technologies and anticipate that follow-up studies with a larger n will reaffirm our findings.

If we merely asked individuals whether they are disgusted by various scenarios, we would conclude that women are more easily disgusted than men, following an evolutionary theory of female sensitivity (Curtis et al., 2004; Fessler and Navarrete, 2003; Oaten et al., 2009). Our follow-up analyses of preferences for gay marriage, however, demonstrate that there are significant differences between female opponents and supporters. Because gay marriage opponents will tend to uphold traditional views of the family and gender roles, it seems likely that these women will value purity (Graham et al., 2009) and report higher disgust sensitivity in line with expectations that women experience and express emotions to a greater degree (Brody and Hall, 2008; Grossman and Wood, 1993; Hess et al., 2000) while adhering to gender stereotypes that cast women as vulnerable (Brody, 1997). Female supporters of gay marriage will be less likely to agree with these traditional tenets and thereby report less disgust sensitivity than opponents, but are unlikely to completely escape gender socialization, which will still have some effect when compared to men overall (Brody, 1999; Brody and Hall, 2000; Hess et al., 2000). It is unlikely individuals will connect the idea of touching a dead body with gay marriage and therefore indicate being disgusted, but it seems plausible that ideology will operate through gender socialization to disgust sensitivity, which is a more salient cue when responding to survey items.

Another interesting implication of our study is the possible strength of male gender socialization, as men report low levels of disgust sensitivity. Without a difference between gay marriage supporters and opponents, our only comparison is versus women, further supporting evolutionary and socialization explanations. When we account for physiological response, however, political preference indicates clear differences between male supporters and opponents of gay marriage. As displayed in our graphical representation of the difference in measures, male supporters of gay marriage are not easily disgusted in their physiological or survey responses, as compared to women and male opponents. Male supporters may be socialized into reporting that they are not disgusted by certain situations, and their autonomic reactivity also supports the notion that they may not be bothered by these encounters. Conversely, male opponents of gay marriage say they are not bothered by disgusting concepts but then exhibit the highest levels of physiological response to disgusting stimuli, suggesting these men are sub-consciously affected by disgusting stimuli but choose not to report this on a survey. The latter response may be the result of socialized gender role expectations about traditional masculine attributes and behaviors, like suppressing emotional expression (Grossman and Wood, 1993) or projecting self-control (Brody and Hall, 2000; Rohrmann et al., 2008).

Use of physiological measures in understanding human social behavior typically relies upon theories of evolutionary psychology or behavior genetics to explain how our attitudes and actions have been biologically instantiated. Alternatively, models exploring socialization effects tend to ignore biological explanations. We suggest that both frameworks can improve our understanding of human social dynamics, especially when they are used together. With the onset of new technologies that reveal underlying predispositions and involuntary responses, it is tempting to proclaim physiology as the “true” measure of behavior, but we still need to understand how these sub-conscious responses manifest in outward behavior. By comparing physiological measures to

conscious self-reports, we may begin to parse out both how our biology connects to actual behavior and what social factors may mediate this process, something that holds great potential for political science research in the future.

References

- Bradley, Margaret M. and Peter J. Lang. 2007. "Emotion and Motivation." In *Handbook of Psychophysiology*, 3rd ed. New York: Cambridge University Press.
- Brody, Leslie R. 1997. "Gender and Emotion: Beyond Stereotypes." *Journal of Social Issues* 53 (2): 369-394.
- Brody, Leslie R. and Judith A. Hall. 2000. "Gender, Emotion, and Expression." In *Handbook of Emotions*, ed. Michael Lewis and Jeannette M. Haviland-Jones. New York: The Guilford Press.
- Cacioppo, John T., Louis Tassinary, and Gary Bernston. 2007. "Psychophysiological Science: Interdisciplinary Approaches to Classic Questions About the Mind." In *Handbook of Psychophysiology*, 3rd ed. New York: Cambridge University Press.
- Curtis, Val, Robert Aunger, and Tamer Rabie. 2004. "Evidence that disgust is evolved to protect from risk of disease." *Proceedings of the Royal Society of London* 271: S131-S133.
- Dawson, Michael, Anne Schell and Disan Filion. 2007. "The Electrodermal System." In *Handbook of Psychophysiology*, 3rd ed. New York: Cambridge University Press.
- Druschel, B.A. and M.F. Sherman. 1999. "Disgust sensitivity as a function of the Big Five and gender." *Personality and Individual Differences* 26: 739-748.
- Ekman, Paul. 1999. "Basic Emotions" In *Handbook of Cognition and Emotion*, ed. Tim Dalgleish and Mick J. Power. West Sussex: John Wiley & Sons.
- Faulkner, Jason, Mark Schaller, Justin H. Park, and Lesley A. Duncan. 2004. "Evolved Disease-

- Avoidance Mechanisms and Contemporary Xenophobic Attitudes.” *Group Processes & Intergroup Relations* 7 (4): 333-353.
- Fischer, Agneta H. 1993. “Sex Differences in Emotionality: Fact or Stereotype?” *Feminism and Psychology* 3 (3): 303-318.
- Graham, Jesse, Jonathan Haidt, and Brian A. Nosek. 2009. “Liberals and Conservatives Rely on Different Sets of Moral Foundations.” *Journal of Personality and Social Psychology* 96 (5): 1029-1046.
- Gross, James J. and Robert W. Levenson. 1993. “Emotional Suppression: Physiology, Self-Report, and Expressive Behavior.” *Journal of Personality and Social Psychology* 64 (6): 970-986.
- Grossman, Michele and Wendy Wood. 1993. “Sex Differences in Intensity of Emotional Experience: A Social Role Interpretation.” *Journal of Personality and Social Psychology* 65 (5): 1010-1022.
- Gruszczynski, Michael W., Amanda Balzer, Carly M. Jacobs, Kevin B. Smith, John R. Alford, and John R. Hibbing. 2011. “The Physiology of Political Participation.” Paper presented at the annual meeting of the American Political Science Association, Washington D.C.
- Haidt, Jonathan and Matthew A. Hersch. 2001. “Sexual Morality: The Cultures and Emotions of Conservatives and Liberals.” *Journal of Applied Social Psychology* 31(1): 191-221.
- Haidt, Jonathan, Clark McCauley, and Paul Rozin. 1994. “Individual differences in sensitivity to disgust: A scale sampling seven domains of disgust elicitors.” *Personality and Individual Differences* 16 (5): 701-713.
- Hess, Ursula, Sacha Senécal, Gilles Kirouac, Pedro Herrera, Pierre Philippot, and Robert E. Kleck. 2000. “Emotional expressivity in men and women: Stereotypes and self-perceptions.” *Cognition and Emotion* 14 (5): 609-642.
- Inbar, Yoel, David A. Pizarro, and Paul Bloom. 2009a. “Conservatives are more easily disgusted than liberals.” *Cognition and Emotion* 23 (4): 714-28.

- Inbar, Yoel, David A. Piarro, Joshua Knobe, and Paul Bloom. 2009b. "Disgust Sensitivity Predicts Intuitive Disapproval of Gays." *Emotion* 9 (3): 435-439.
- Kreibig, Sylvia D. 2010. "Autonomic nervous system activity in emotion: A review." *Biological Psychology* 84: 394-421.
- Kring, Ann M. and Albert H. Gordon. 1988. "Sex Differences in Emotions: Expression, Experience, and Physiology." *Journal of Personality and Social Psychology* 74 (3): 686-703.
- Levenson, Robert W., Paul Ekman, and Wallace V. Friesen. 1990. "Voluntary Facial Action Generates Emotion-Specific Autonomic Nervous System Activity." *Psychophysiology* 27 (4): 363-384.
- Mutz, Diana C. 2007. "Effects of 'In-Your-Face' Television Discourse on Perceptions of a Legitimate Opposition." *American Political Science Review* 101 (4): 621-635.
- Navarrete, Carlos David, and Daniel M.T. Fessler. 2006. "Disease avoidance and ethnocentrism: the effects of disease vulnerability and disgust sensitivity on intergroup attitudes." *Evolution and Human Behavior* 27: 270-282.
- Oaten, Megan, Richard J. Stevenson, and Trevor I. Case. 2009. "Disgust as a Disease-Avoidance Mechanism." *Psychological Bulletin* 135 (2): 303-321.
- Olatunji, Bunmi O., Jonathan Haidt, Dean McKay, and Bieke David. 2008. "Core, animal reminder, and contamination disgust: Three kinds of disgust with distinct personality, behavioral, physiological, and clinical correlates." *Journal of Research in Personality* 42: 1243-1259.
- Olatunji, Bumi O. and Craig N. Sawchuk. 2005. "Disgust: Characteristic Features, Social Manifestations, and Clinical Implications." *Journal of Social and Clinical Psychology* 24 (7): 932-962.
- Olatunji, Bunmi O., Nathan L. Williams, David F. Tolin, Jonathan S. Abramowitz, Craig N. Sawchuk, Jeffrey M. Lohr, and Lisa S. Elwood. 2007. "The Disgust Scale: Item Analysis,

- Factor Structure, and Suggestions for Refinement.” *Psychological Assessment* 19 (3): 281-297.
- Oxley, Douglas R., Kevin B. Smith, John R. Alford, Matthew V. Hibbing, Jennifer L. Miller, Mario Scalora, Peter K. Hatemi, and John R. Hibbing. 2008. “Political Attitudes Vary With Physiological Traits.” *Science* 321: 1667-1670.
- Plant, E. Ashby, Janet Shibley Hyde, Dacher Keltner, and Patricia G. Devine. 2000. “The Gender Stereotyping of Emotions.” *Psychology of Women Quarterly* 24: 81-92.
- Rohrmann, Sonja, Henrik Hopp, and Markus Quirin. “Gender Differences in Physiological Responses to Disgust.” *Journal of Psychophysiology* 22 (2): 65-75.
- Rozin, Paul, Jonathan Haidt, and Clark R. McCauley. 1999. “Disgust: The Body and Soul of Emotion.” In *Handbook of Cognition and Emotion*, ed. Tim Dalgleish and Mick J. Power. West Sussex: John Wiley & Sons.
- Rozin, Paul, Jonathan Haidt, and Clark R. McCauley. 2000. “Disgust” In *Handbook of Emotions*, ed. Michael Lewis and Jeannette M. Haviland-Jones. New York: The Guilford Press.
- Rozin, Paul, Jonathan Haidt, Clark R. McCauley, Lance Dunlop and Michelle Ashmore. 1999. “Individual Differences in Disgust Sensitivity: Comparisons and Evaluations of Paper-and-Pencil versus Behavioral Measures.” *Journal of Research in Personality* 33: 330-351.
- Schaller, Mark and Lesley A. Duncan. 2007. “The Behavioral Immune System: Its Evolution and Social Psychological Implications.” In *Evolution and the Social Mind*, ed. Joseph P. Forgas, Martie G. Haselton, and William von Hippel. New York: Psychology Press.
- Schienle, Anne, Rudolf Stark, and Dieter Vaitl. 2001. “Evaluative Conditioning: A Possible Explanation for the Acquisition of Disgust Responses?” *Learning and Motivation* 32: 65-83.
- Shields, Stephanie A. 2002. *Speaking from the Heart: Gender and the Social Meaning of Emotion*. Cambridge: Cambridge University Press.
- Smith, Kevin and John Hibbing. 2011. “The Mind Body Connection: Psychophysiology As An

Approach to Studying Political Attitudes and Behaviors.” *The Political Animal*. Chicago: University of Chicago Press.

Smith, Kevin, Doug Oxley, Matthew Hibbing, John Alford, and John Hibbing. 2009.

“Physiological Response to Disgusting Stimuli as a Marker for Political Orientations.” Paper presented at the annual meeting of the Midwest Political Science Association, Chicago.

Smith, Kevin, Doug Oxley, Matthew Hibbing, John Alford, and John Hibbing. 2011. “Linking

Genetics and Political Attitudes: Re-Conceptualizing Political Ideology.” *Political Psychology*, no. doi: 10.1111/j.1467-9221.2010.00821.x.

Stark, Rudolf, Bertram Walter, Anne Schienle, and Dieter Vaitl. 2005. “Psychophysiological

Correlates of Disgust and Disgust Sensitivity.” *Journal of Psychophysiology* 19 (1): 50-60.

Terrizzi, John A., Natalie J. Shook, W. Larry Ventis. 2010. “Disgust: A predictor of social

conservatism and prejudicial attitudes toward homosexuals.” *Personality and Individual Differences* 49: 587-592.

Vanman, Eric J., Jessica Saltz, Lauri Nathan and Jennifer Warren. 2004. “Racial Discrimination by

Low-Prejudiced Whites: Facial movements as Implicit Measures of Attitudes Related to Behavior.” *Psychological Science* 15: 711-714.

Figure 1: Disgust sensitivity by measurement, gender and support for gay marriage

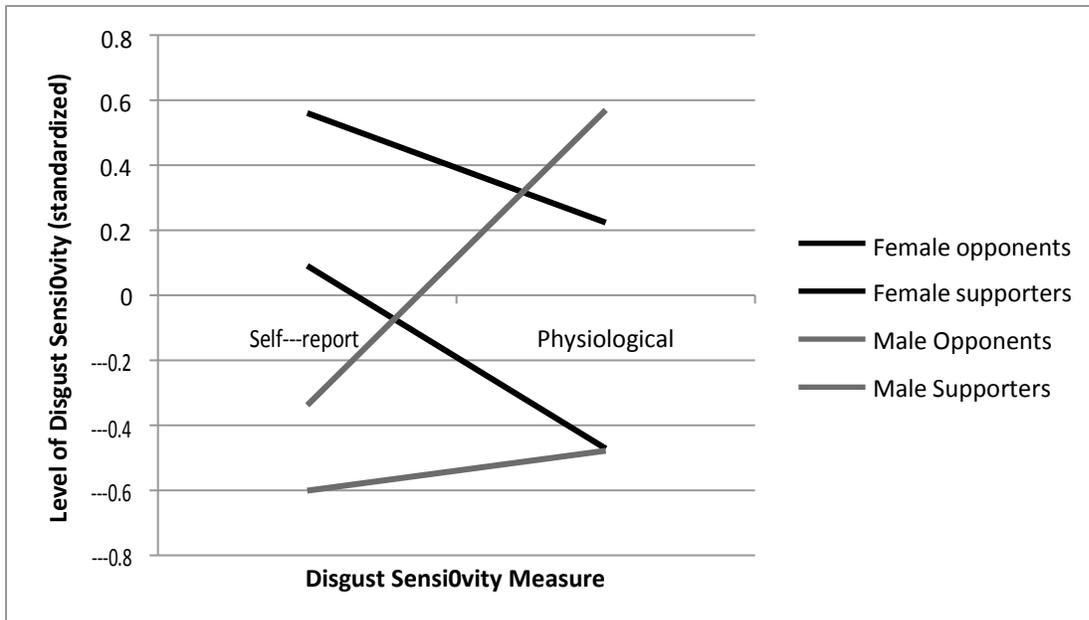


Table 1: Mean physiological responses to disgusting stimuli and mean self-reported disgust sensitivity by gender and support for gay marriage

Physiology	Gay marriage		Total
	Oppose	Support	
Gender			
Female	.224 n=13	-.472 n=14	-.13
Male	.570 n=11	-.478 n=9	.10
Total	.382	-.474	

Self-report	Gay marriage		Total
	Oppose	Support	
Gender			
Female	.561 n=12	.091 n=14	.308
Male	-.339 n=9	-.601 n=9	-.470
Total	.175	-.180	

Table 2: OLS regression results on support for banning gay marriage

	Full Model	Reduced Model	
Women (n = 27)	F = 2.33, p = .088	F = .552, p = .652	
	β	β	R² change
Constant	3.953*	4.176†	
Self-reported disgust	.760*		
Physiological disgust	.449†	.280	
Age	-.043	-.035	
Education	.020†	-.057	
R ²	.298	.067	-.230*
Men (n = 20)	F = 4.737, p = .066	F = 3.943, p = .028	
	β	β	R² change
Constant	5.334*	5.325**	
Self-reported disgust	-.035		
Physiological disgust	.985**	.981**	
Age	-.021	-.021	
Education	-.417†	-.409†	
R ²	.425	.425	.000

Note: † < .11; * < .05; ** < .01; *** < .001