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# Is that disgust I see? Political ideology and biased visual attention

Benjamin Oosterhoff[a,*,1], Natalie J. Shook[b], Cameron Ford[b]

[a] University of Texas Health Science Center at Houston, Department of Psychiatry and Behavioral Sciences, 1941 East Road, Houston, TX, 77054, USA
[b] West Virginia University, Department of Psychology, P.O. Box 6040, Campus Drive, Morgantown, WV, 26505, USA

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ABSTRACT

Considerable evidence suggests that political liberals and conservatives vary in the way they process and respond to valenced (i.e., negative versus positive) information, with conservatives generally displaying greater negativity biases than liberals. Less is known about whether liberals and conservatives differentially prioritize certain forms of negative information over others. Across two studies using eye-tracking methodology, we examined differences in visual attention to negative scenes and facial expressions based on self-reported political ideology. In Study 1, scenes rated high in fear, disgust, sadness, and neutrality were presented simultaneously. Greater endorsement of socially conservative political attitudes was associated with less attentional engagement (i.e., lower dwell time) of disgust scenes and more attentional engagement toward neutral scenes. Socially conservative political attitudes were not significantly associated with visual attention to fear or sad scenes. In Study 2, images depicting facial expressions of fear, disgust, sadness, and neutrality were presented simultaneously. Greater endorsement of socially conservative political attitudes was associated with greater attentional engagement with facial expressions depicting disgust and less attentional engagement toward neutral faces. Visual attention to fearful or sad faces was not related to social conservatism. Endorsement of economically conservative political attitudes was not consistently associated with biases in visual attention across both studies. These findings support disease-avoidance models and suggest that social conservatism may be rooted within a greater sensitivity to disgust-related information.

## 1. Introduction

Over the past 10 years, a growing body of research has documented reliable systematic differences among political liberals and conservatives in their attention, learning, and responses to valenced (i.e., positive or negative) information (see [1], for a review). In general, individuals who endorse more politically conservative beliefs tend to demonstrate a greater negativity bias than those who endorse more politically liberal beliefs [2,3,4]. Specifically, relative to liberals, politically conservative individuals process negative information as more salient, potent, and dominant compared to positive information [5]. Although this research provides consistent evidence of differential processing of positive versus negative information along political lines, less is known about whether ideological differences in negativity biases are specific to certain types of negative information. Recent evidence indicates that those who more strongly endorse politically conservative beliefs may be particularly sensitive to stimuli that evoke disgust [6–8], suggesting that variation in ideology may be strongly linked with disgust-related biases. Identifying whether ideological differences in negativity biases are specific to certain types of negative information may provide novel insight into the role of emotions in the formation and maintenance of different political attitudes. Utilizing eye-tracking methodology across two studies, the purpose of this research was to examine whether variation in political attitudes is associated with visual attention to different types of negative information (disgust, fear, or sadness).

### 1.1. Political ideology and negativity biases

Political ideology has been characterized as a "set of beliefs about the proper order of society and how it can be achieved" [9], p. 64) and is commonly classified on a liberal-conservative continuum within Western cultures [10]. In the United States, the liberal-conservative continuum represents a spatial axis characterized by the prioritization of individual liberty on the left (i.e., liberalism) and the prioritization of authority, institutions, and traditions on the right (i.e., conservatism [11]. This continuum can be disaggregated further along social versus economic dimensions. For example, economic conservatism refers to

* Corresponding author.
*E-mail address:* Benjamin.Oosterhoff@bcm.edu (B. Oosterhoff).
[1] Present address: Baylor College of Medicine/Texas Children's Hospital, USA.

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beliefs consistent with lower taxes and limited government involvement in business and personal life [10], whereas social conservatism is represented by the endorsement of attitudes that encourage adherence to social norms, conventions, and tradition, and emphasizes social exclusivity [12].

Research examining the intersection between political ideology and the processing of valenced information has typically focused on elucidating individual differences along the liberalism-conservatism continuum (see Ref. [1], for a review). In general, this research has found that individuals who more strongly endorse politically conservative beliefs are more sensitive to negative information than positive information. For instance, greater endorsement of political conservativism is associated with more negative ratings of valenced images [1] and greater agreement with negatively-framed messages [13]. These differences have also been demonstrated in the fundamental way individuals approach their social world, acquire information, and form attitudes [14]. Those who endorse greater political conservatism are generally more avoidant and form more negative attitudes than positive attitudes, whereas more politically liberal individuals tend to be more exploratory and form positive and negative attitudes more equally. Political conservatism is also associated with less susceptibility to conditioning with positive stimuli, which results in the formation of fewer positive attitudes [15].

Ideological differences in negativity biases have also been found in research assessing physiology and visual gaze patterns. For instance, political conservatives exhibit increased skin conductance in response to negative images and display a stronger startle eyeblink response to a sudden, loud noise relative to liberals [3]. Further, political conservatives more quickly oriented towards and spent more time engaged with aversive stimuli (e.g., spiders, maggots, fighting) than appetitive stimuli (e.g., happy children), whereas liberals more quickly oriented towards and spent more time engaged with appetitive images than aversive stimuli [2]. These findings suggest that political conservatives display a greater reactivity and preoccupation with negative information compared to political liberals. However, it is unknown whether these differences are rooted within reactions to specific types of negative information, such as objects or situations that evoke fear, sadness, or disgust.

### 1.2. Political ideology and disgust

Ideological differences in negativity biases may be particularly notable in the context of disgust. Disgust is thought to have evolved to serve a disease-avoidance function [16] and is often evoked by the sight, sound, or smell of stimuli that may contain pathogens (e.g., blood, feces, vomit). Experiencing disgust encourages individuals to distance themselves from the emotion eliciting source, thereby reducing contact and potential contamination. Individuals vary in their sensitivity to disgust, and greater disgust sensitivity is thought to motivate social behaviors and beliefs that limit contact with potential sources of pathogenic threat [12].

Evolutionary psychologists have proposed that disgust may play an important role in shaping social attitudes, particularly those that support group norms and social exclusivity [17]. Prior to modern medicine and advancements in technology, the cause of infections and disease were often unknown. Disease control is thought to have depended heavily on the development of behavioral norms that limited contamination and potential infection (e.g., food storage and preparation, hand-washing). Deviation from these social norms may have thus increased exposure to pathogens [18]. Contact with outgroup members may have also posed pathogenic threat. A primary source of disease transmission is other people. Evolutionarily, outgroup members carried foreign pathogens for which the individual did not have immunity, thus increasing the spread of disease. Accordingly, the disease-avoidance function of disgust may encourage social attitudes conducive of adherence to social norms and exclusion of outgroup members [16]. Indeed, greater disgust sensitivity is associated with more punitive attitudes toward criminals [19] and higher levels of ethnocentrism, prejudice, and anti-immigration attitudes [20,21]. Inducing disgust leads to greater contempt in response to counter-normative behavior [22] and higher levels of prejudice toward foreigners [23]. Disgust sensitivity is also associated with broad social values that support adherence to social norms and avoidance of outgroup members, such as collectivism, right-wing authoritarianism, and religious fundamentalism [12,17].

Support for social norms and outgroup exclusivity are important components of social conservatism, which are reflected in cornerstone political issues (e.g., strict drug and immigration policies). Thus, those who are more sensitive to disgust may also more strongly endorse conservative political attitudes as a means of promoting adherence to social norms and avoidance of outgroup members. Several studies have reported that disgust sensitivity is positively associated with more conservative political views [7,8,21], and these associations tend to be stronger for social (e.g., immigration, gay marriage) versus economic (e.g., minimum wage, taxes) issues and policies [8,16]. Importantly, some evidence suggests that those who endorse greater political conservatism may be more reactive to disgust relative to other forms of negative or threatening information. Ahn et al. [6] presented individuals with disgusting, threatening, pleasant, and neutral scenes while in an fMRI scanner. Stronger endorsement of politically conservative attitudes was associated with greater neural activity in response to disgust images, but not threatening, positive, or neutral images. Additionally, Smith et al. [4] had participants view a series of positive and negative images that ranged in valence and arousal while assessing electrodermal response and heart rate. Greater endorsement of political conservatism was associated with more physiological reactivity to disgust images, but not fear or anxiety images.

In sum, current evidence demonstrates that political conservatism is associated with greater reactivity to negative stimuli and perhaps more specifically to disgust. However, to date, no research has directly tested links between political attitudes and attention to specific forms of negative information. Capturing individual differences in visual attention may be an especially useful way to help identify ideological differences in response to specific forms of negative information. Directing and redirecting attention is an important component of emotion generation and regulation [24], and the selective information gained through visual attention helps inform social attitudes [25]. Thus, visual attention is closely linked with emotional processing and has direct implications for social belief systems. Further, the allocation of visual attention requires a person to prioritize certain stimuli within their visual field over others, which provides an important methodological control for isolating ideological differences in the processing of valenced information.

To date, scholars have not directly examined the intersection between political ideology and visual attention towards disgust-related stimuli. Nevertheless, research examining disgust and attention more broadly may inform how political ideology could be linked to visual attention patterns. This research points to potential variation in attentional engagement patterns (i.e., the length of time an individual is fixated on an object) based on whether participants were viewing disgusting scenes or facial expressions [26]. Consistent with evolutionary theory [16] and behavioral research [27], some evidence suggests that experiencing disgust may prompt *less* visual engagement with disgusting scenes [28], potentially as a means of regulating arousal through visual avoidance. In contrast, those who endorse greater obsessive compulsive disorder symptoms (and are thus more sensitive to disgust) display *greater* visual engagement for disgust faces [29]. Disgust faces may be less aversive than disgusting scenes, and they may indicate that a potential disease threat is present, thus prompting sustained attention. Together, this research suggests that those who are more sensitive to disgust may be less visually engaged with disgusting scenes and more visually engaged with disgust faces. Given that political conservatism is linked with greater sensitivity to disgust [12], it is

possible that those who endorse greater political conservatism are less visually engaged with disgusting scenes and more visually engaged with disgust faces.

### 1.3. Current research

The primary goal of this research was to examine whether variation in political ideology is associated with visual attention to specific types of negative information. Across two studies using eye tracking methodology, we examined ideological differences in visual attention patterns for three distinct types of negative stimuli (disgust, fear, and sadness) and neutral controls presented simultaneously. Based on the growing body of research linking political ideology with disgust specifically [4,6–8], we hypothesized that political ideology would be associated with differential visual attention patterns related to the disgust stimuli. Specifically, we hypothesized that greater conservatism would be associated with lower attentional engagement with disgust scenes and greater attentional engagement with disgust faces. Given that disease-avoidance models propose that *social* (and not economic) conservatism serves as a means of reducing disease threat, it was expected that these links would be specific to social (and not economic) issues. We did not expect visual engagement for the fear, sadness, or neutral stimuli to vary by political ideology based on previous studies that did not find differences in physiological responses to such stimuli along political ideological lines [6,4].

## 2. Study 1

The purpose of Study 1 was to examine associations among political ideology and visual attention to specific negative stimuli. Using an eye-tracking procedure adapted from [2], participants were simultaneously presented with four images depicting scenes representing three distinct types of negative information (i.e., disgust, fear, sadness) and one neutral scene in quadrant format. Motivated social-cognition models propose that "people embrace political conservatism (at least in part) because it serves to reduce fear, anxiety, and uncertainty…" [30], p. 340). Thus, fear was chosen as an alternative form of negative information that may differentially attract the attention of those who more strongly endorse liberal or conservative political attitudes. Sadness was chosen as it is an easily identified and common type of negative information. There was no theoretical reason to expect ideological differences in visual attention to sad stimuli. Thus, the sad stimuli served as a means of assessing whether stronger endorsement of politically conservative attitudes is associated with a general (rather than specific) bias toward negative information. The neutral image was included as a non-negative, control option.

The four quadrant paradigm requires participants to prioritize certain types of negative information in their visual attention over others, and allows for the examination of ideological differences in attention biases for specific negative stimuli. Previous research has demonstrated that experiencing disgust is associated with less attentional engagement with disgust-related scenes [28,31]. Thus, given the association between disgust sensitivity and political conservatism [7,8,21], we hypothesized that greater political conservatism would be associated with less attentional engagement with disgust stimuli. Further, it was expected that these links would be specific to social (and not economic) conservatism.

### 2.1. Materials and methods

#### 2.1.1. Participants

Participants were 125 introductory psychology students from a university in the mid-Atlantic region of the United States.[2] Due to missing data on the measure of political ideology ($n$ = 10) or malfunctioning with the eye-tracking equipment ($n$ = 21), the final analytic sample consisted of 94 students ($M_{age}$ = 19.19, $SD$ = 3.73; 57.6% female). Participants were 84.8% White, 8.9% African American/Black, and 6.3% other. Participants varied in their political identification: 31.3% Republican, 26.3% Democrat, 18.2% Independent, 4.4% Libertarian, and 7.1% 'Other.' No participants indicated that they had a serious visual impairment.

#### 2.1.2. Apparatus

The primary instruments consisted of the Tobii X2-30 eye-tracker connected to a Windows 7 Enterprise 64-bit computer, with 8.00 GB RAM and an i5-2400, 3.10 GHz Intel processor. The sample rate of the eye tracker is 30 Hz, with spatial resolution between 0.5° to 1.0° [32]. Stimuli were presented on a ViewSonic 22 inch 120 Hz LCD Monitor.

#### 2.1.3. Materials

To select images representative of the desired emotion categories, a pilot study was conducted with 50 undergraduate students (70.6% female, $M_{age}$ = 19.78, $SD$ = 1.98; 98% White). A total of 70 images hypothesized to evoke disgust ($n$ = 26), fear ($n$ = 14), sadness ($n$ = 15), and neutrality ($n$ = 15) were obtained from both the International Affective Picture System [33] and various sources on the internet. Participants were randomly presented with one image at a time and asked to provide ratings on the extent to which they viewed each image as scary, sad, angry, happy, and disgusting, using a scale from 1 (*not at all*) to 5 (*extremely*). The ratings for each emotion were averaged across participants for each image. Within-subjects ANOVAs were used to identify images that represented specific emotion categories (see supplemental material). The pilot study resulted in the retention of 10 disgust images, 7 fear images, 5 sad images, and 12 neutral images. The disgust images represented both bodily (e.g., a cut hand) and non-bodily (e.g., dog feces) objects. The fear images included large threating animals (e.g., a bear, wolf) or situations involving lethal weapons. The sad images included individuals or animals that appeared to be injured (without any disgust or danger cues), as well as those depicting property damage. The neutral images included standard house and office supplies (e.g., a stapler).

To ensure gaze patterns were not due to systematic variation in low-level visual properties of the images, each image underwent across-stimuli normalization for size, color, luminosity, complexity, and contrast. All images were resized to 320 × 260 pixels and converted to .jpeg format. Luminosity and color saturation (red, green, blue) were measured using Adobe Photoshop version 6. Image complexity was operationalized as the number of bytes in the .jpeg image file size, with larger files indicating greater complexity [34]. The root-mean-square (RMS) contrast was used to assess contrast [35]. Table 1 displays the means and standard errors for valence ratings, arousal ratings, luminescence levels, complexity, RMS contrast, and red, green, and blue color saturation for each type of image. A series of one-way ANOVAs with Bonferroni-corrected pairwise comparisons were used to compare the stimulus characteristics for each image type (see Table 1). There was a significant effect for both valence and arousal. The mean valence rating was lower and the mean arousal rating was higher for fear, disgust, and sadness images compared to neutral images. The mean arousal rating was slightly higher for fear images compared to disgust images. The mean luminescence level, complexity, RMS contrast, and the red, green, and blue color saturation did not differ across image type. Together, these findings indicate that the primary difference concerned valence and arousal between neutral and non-neutral images and that images were comparable in terms of low-level visual

[2] Sample size was determined based on a power analysis using an anticipated effect size of $r$ = 0.32 found in prior research Dodd et al., 2014. Analyses using G*power 3.1.7 indicated that 125 participants would provide 95% power to detect an effect of $r$ = 0.32 assuming $\alpha$ = 0.05.

**Table 1**
Means and Standard Errors for Study 1 Stimulus Characteristics Separated by Emotion Category.

| | Fear | | Disgust | | Sad | | Neutral | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *M* | *SE* | *M* | *SE* | *M* | *SE* | *M* | *SE* | *F*(3, 30) | $\eta_p^2$ |
| Valence | $2.74_a$ | 0.18 | $2.34_a$ | 0.15 | $2.44_a$ | 0.21 | $5.11_b$ | 0.15 | 73.20*** | 0.89 |
| Arousal | $5.43_a$ | 0.28 | $4.02_b$ | 0.24 | $4.30_{a,b}$ | 0.33 | $1.53_c$ | 0.24 | 42.07*** | 0.82 |
| Luminescence | 86.65 | 10.08 | 103.28 | 8.37 | 111.36 | 11.84 | 115.60 | 7.64 | 1.87 | 0.16 |
| Complexity | 695.19 | 111.85 | 585.73 | 93.58 | 664.76 | 132.34 | 651.66 | 85.43 | 0.21 | 0.02 |
| RMS contrast | 1.51 | 0.37 | 1.82 | 0.31 | 2.03 | 0.44 | 2.38 | 0.28 | 1.33 | 0.12 |
| Red channel saturation | 88.63 | 11.26 | 116.18 | 9.42 | 119.57 | 13.32 | 126.67 | 8.60 | 2.49 | 0.20 |
| Green channel saturation | 86.99 | 10.44 | 99.37 | 8.74 | 108.45 | 12.36 | 113.07 | 7.98 | 1.44 | 0.13 |
| Blue channel saturation | 79.39 | 11.18 | 89.42 | 9.36 | 104.72 | 13.23 | 99.28 | 8.54 | 0.98 | 0.09 |

*Notes*: Means with different subscripts significantly differ from one another and means with identical subscripts do not significantly differ from one another. RMS = Root-Mean-Squared.
*** $p < 0.001$.

properties.

#### 2.1.4. Stimulus displays

Stimulus displays consisted of four images (one fear image, one disgust image, one sad image, and one neutral image) presented simultaneously. The sad, fear, disgust, and neutral images were randomly matched which resulted in 12 trials that were repeated over two blocks (24 trials total). Additional filler displays were used to ensure participants were exposed to each image at an equal frequency. Images were 320 × 260 pixels which equates to a 10° × 9° visual angle at a 60 cm viewing distance and a 1024 × 768 resolution. The images were displayed in each corner of the screen. The distance from the viewing point to the image was approximately 7°. The vertical distance between images was 8° and the horizontal distance between each image was 12°, which produced void space between images. The purpose of this void space was to help limit potential misclassification of gaze indices due to error in spatial resolution of the eye tracker. The image location was randomized and balanced (i.e., each image type was presented in each corner an equal number of times) within each block. Consistent with prior research [34], image location was also randomized across blocks while keeping the distance from the initial fixation point consistent, thus lowering the likelihood that the spatial location accounted for any biases and limiting potential bias due to scanning strategies. All stimulus displays used in this study are presented in the supplemental material.

#### 2.1.5. Procedure

Upon arrival at the lab, participants were escorted to a well-lit private room with a Tobii X2-30 connected to a computer. Sessions were run one person at a time. Participants were told that the study concerned how individuals recognized different types of stimuli. To keep participants engaged in the task, they were told to press the "Spacebar" key when a specific neutral scene appeared on the screen. Participants were seated in a chair 60 cm away from the viewing screen and completed a short calibration procedure which consisted of visually following a red dot as it travelled to areas of the computer monitor. Calibration was accepted if the average error was less than 1° visual angle. Participants then completed 6 practice blocks to become familiarized with the procedure.

Prior to each trial, a fixation point represented by a cross-hair was presented in the middle of the screen. Participants were instructed to focus their attention on the fixation point when it appeared. The fixation point remained the only stimuli on the screen for 3000 milliseconds after which the four images appeared for 5000 milliseconds (the fixation point stayed on the screen during the image viewing so that the images were the only change in the field of vision). Once the display had passed, the images disappeared leaving only the fixation point and signaling a new trial. This process continued until the block was complete. Participants were then given a short break and began the second block.

After the eye-tracking task, participants completed several questionnaires. Randomly presented within these questionnaires was the political ideology measure, which consisted of 17 items (adapted from [15]; see supplemental material for all items). Participants rated the extent to which they agreed with a series of statements regarding political stances on a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Political ideology was assessed by averaging all items of the scale, such that higher numbers indicate greater endorsement of conservative political attitudes ($M = 2.70$, $SD = 0.64$; $\alpha = 0.83$). Political ideology was further divided into *social* (11 items; $\alpha = 0.73$) and *economic* (6 items; $\alpha = 0.62$) issues. Social issues assessed agreement with social policies, such as homelessness, immigration, homosexuality, abortion, drug laws, and sex education. Consistent with prior research [10], the economic issues assessed support for lower taxes, reduced government spending, and lower government regulation of business and healthcare. Mean scores were calculated with higher values indicating greater social ($M = 2.44$, $SD = 0.75$) and economic ($M = 3.02$, $SD = 0.59$) conservatism. Participants also completed standard demographics questions and indicated their political party affiliation. Finally, participants were debriefed, thanked, and awarded extra credit for their time. The study protocol received approval from the research ethics review board at the second author's institution.[3]

#### 2.1.6. Attentional engagement indices

Attentional engagement was operationalized by measures of *dwell time*. Dwell time represented the average amount of total time spent fixated on a particular type of image. Dwell time was calculated for each image type (fear, disgust, sad, neutral) separately. To account for individual differences in overall attentional patterns, dwell time for each image type was converted into proportion scores by dividing the total dwell time for a specific image type by the total dwell time across all image types Ref. [34].[4,5]

### 2.2. Results

#### 2.2.1. Preliminary analyses

A 4 (image type: fear, disgust, sadness, neutral) x 2 (block: first versus second) repeated measures ANOVA was used to examine whether dwell time varied by image type and block. There was a main effect of image type, $F(3, 91) = 16.61$, $p < 0.001$, $\eta_p^2 = 0.35$. This effect was similar for both blocks ($F < 1$) and was not qualified by an image

[3] We have reported all measures, conditions, and data exclusions in this study.
[4] Information on attentional orientation was also available (i.e., latency to first fixation, probability of first fixation). Although there was no prior support for a connection between disgust and attentional orientation, exploratory analyses tested whether political ideology was correlated with attentional orientation. All correlations ranged from $rs = -0.19$ to 0.11 and were nonsignificant. These analyses are available in the supplemental material.
[5] Findings are consistent whether proportion scores or raw scores are used.

**Table 2**
Bivariate Correlations between Political Ideology and Attentional Engagement by Image Type in Study 1.

| | Dwell Time | | | |
|---|---|---|---|---|
| | Fear | Disgust | Sadness | Neutral |
| Political Conservatism | 0.04 | −0.18$^{+}$ | −0.11 | 0.21$^{*}$ |
| Social Conservatism | 0.02 | −0.22$^{*}$ | −0.08 | 0.24$^{*}$ |
| Economic Conservatism | 0.05 | −0.04 | −0.09 | 0.06 |

$^{+}$ $p < 0.10$.
$^{*}$ $p < 0.05$.

type x block interaction ($F < 1$). Planned comparisons indicated that participants displayed a longer dwell time (in milliseconds) for disgust ($M = 1058$, $SE = 28$) and sadness ($M = 1148$, $SE = 23$) images compared to fear ($M = 944$, $SE = 25$) and neutral ($M = 850$, $SE = 32$) images ($ps < 0.05$). Preliminary analyses also indicated that social conservatism was positively correlated with economic conservatism ($r = 0.50$, $p < 0.001$).

#### 2.2.2. Visual attention and political ideology

Bivariate correlations were used to examine associations among political ideology and attentional engagement (see Table 2). Greater endorsement of conservative political attitudes was marginally correlated with proportionally lower dwell time for disgust images. Greater endorsement of conservative political attitudes was also significantly correlated with proportionally greater dwell time for neutral images. Endorsement of conservative political attitudes was not significantly correlated with dwell time for fear or sadness images. When examining social and economic issues separately, greater endorsement of socially conservative political attitudes was significantly correlated with proportionally lower dwell time for disgust images and proportionally greater dwell time for neutral images.[6] Endorsement of economically conservative political attitudes was not significantly correlated with dwell time across any image type.

### 2.3. Discussion

The purpose of this study was to examine ideological differences in visual attention patterns to different types of negative information. In support of our hypotheses, participants who more strongly agreed with conservative social policies were less visually engaged with disgust-related images. These findings are consistent with other evidence which suggests that experiencing disgust is linked with less attentional fixation on disgust-related images [28]. Visual avoidance of disgust stimuli is thought to serve the same functional means as behavioral avoidance, in that it allows for the regulation of the physiological response of disgust and reduces the likelihood of coming into contact with harmful pathogens [29]. Thus, those who endorse greater social conservatism may display less visual engagement with disgust scenes as a means of lowering arousal and reducing contact with objects that pose pathogenic threat. This visual response may be prioritized when confronted with multiple sources of negative information. We also found that greater agreement with socially conservative attitudes was associated with greater dwell time for neutral images. The neutral images may have provided a low arousal alternative for visual engagement that facilitates avoidance of disgust.

Consistent with theory and our hypotheses, these effects appeared to be specific for socially conservative issues and were not found for individuals who endorsed economically conservative attitudes. We also did not find evidence of ideological differences in attentional engagement with fear or sadness. Thus, ideological differences in negativity bias may be specific to social conservatism and more pronounced for certain types of negative information, rather than a general bias across all types of negative information.

Findings from this study may seem inconsistent with prior research which has shown that political conservatives display greater attentional engagement with aversive stimuli relative to political liberals [2]. However, there were important methodological differences between the two eye-tracking paradigms that may account for the differences in findings. First, Dodd et al. [2] presented three appetitive stimuli paired with one aversive stimulus and vice versa. They then compared attention patterns to the two general categories of stimuli (i.e., aversive and appetitive), whereas we examined the specific individual attention patterns to three negative and one neutral stimuli separately. Second, the aversive images used in [2] included stimuli thought to evoke anger, fear, and disgust, whereas we used stimuli that evoked disgust, fear, and sadness. Experiencing anger, disgust, and fear prompt distinct behavioral tendencies [27,36] and images that evoke these emotions may produce different attentional signatures [29]. It is possible that ideological variation in visual attention towards anger, fear, sadness, and, disgust scenes exhibit similar heterogeneity, particularly when presented with different comparison stimuli (i.e., positive versus neutral images). Lastly, Dodd et al. utilized a free-view procedure in which participants were able to look anywhere on the screen for eight seconds during a trial, whereas our procedure involved a five second visual search in which participants were asked to press the spacebar on the keyboard when they located a specific neutral image. The differing instructions and trial time may have altered participants' attentional patterns. Thus, it is difficult to directly compare the results from these studies.

## 3. Study 2

Study 1 provided preliminary evidence that social conservatism is linked with visual attention biases for scenes depicting disgusting stimuli. In Study 2, we extended these findings by examining whether political ideology is associated with visual attention to social cues indicating the presence of a negative stimulus in the immediate environment. If politically conservative individuals are less visually engaged with disgust-evoking stimuli as a means of avoiding pathogenic threat, they may be more attuned to signals that communicate the presence of a disgusting object in the surrounding area.

Emotional expressions are theorized to be one way in which individuals communicate the presence of environmental threat [37]. For example, expressions of fear are thought to signal the potential presence of danger, and expressions of disgust are thought to indicate the presence of disease bearing microbial pathogens [38]. Successful identification and interpretation of these expressions increases the likelihood of survival by motivating the avoidance of threat [37]. Prior research has used facial expressions as a means of depicting environmental cues that indicate the presence of threat [39,40]. Similar to Study 1, this study focused on examining ideological differences in visual attention among facial expressions depicting negative emotions (fear, disgust, sadness) and a neutral control. Based on prior research [12,29] and findings from Study 1, it was hypothesized that greater endorsement of social (but not economic) conservative policies would be associated with greater attentional engagement with disgust facial expressions.

### 3.1. Method and materials

#### 3.1.1. Participants

Participants were 136 introductory psychology students from a university in the mid-Atlantic region of the United States.[7] Due to

[6] Follow-up analyses were performed to ensure effects were similar based on whether the disgust image depicted bodily harm or non-bodily harm. The general magnitude and direction of effects did not differ across disgust images.

[7] Sample size was determined based on the power analysis performed for Study 1. Note

**Table 3**
Aggregate Validation Rating of Facial Images Used in Study 2.

| | Fear | | Disgust | | Sad | | Neutral | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *M* | *SE* | *M* | *SE* | *M* | *SE* | *M* | *SE* | *F*(3, 28) | $\eta_p^2$ |
| Valence | $2.13_a$ | 0.08 | $2.05_a$ | 0.08 | $2.11_a$ | 0.08 | $2.96_b$ | 0.08 | 29.78*** | 0.76 |
| Intensity | $4.28_a$ | 0.15 | $3.76_{a,c}$ | 0.15 | $3.29_{b,c}$ | 0.15 | $3.45_c$ | 0.15 | 8.16*** | 0.47 |
| Clarity | 4.16 | 0.16 | 3.73 | 0.16 | 3.58 | 0.16 | 3.70 | 0.16 | 2.66 | 0.22 |
| Genuineness | $3.00_a$ | 0.11 | $3.00_a$ | 0.11 | $2.83_a$ | 0.11 | $3.83_b$ | 0.11 | 17.26*** | 0.65 |

*Notes*: Values with different subscripts significantly differ from one another and values with the same subscript do not significantly differ from one another. These ratings were obtained through the Radbound database.
*** $p < 0.001$.

missing data on the political ideology measure ($n = 9$) or visual attention indices ($n = 22$), the final analytic sample consisted of 105 students ($M_{age} = 19.50$, $SD = 2.63$; 77.6% female). Participants were 79.2% White, 5.7% African American/Black, 5.7% Asian, and 9.4% other. Participants varied in their political identification: 35.8% Republican, 26.4% Democrat, 25.5% Independent, 2.8% Libertarian, and 9.4% 'Other.' No participants indicated that they had a serious visual impairment.

### 3.1.2. Materials and stimulus displays

A total of 32 images were selected from the well-validated Radbound facial image database [41]. Images consisted of an equal number of male and female Caucasian models displaying fear ($n = 8$), disgust ($n = 8$), sad ($n = 8$), and neutral ($n = 8$) facial expressions with their gaze directed at the perceiver. Validation for the Radbound facial image database was originally provided by 276 undergraduate students who rated the valence, intensity, clarity, and genuineness of each expression (reported in [41] on 5-point scales from 1 (*negative/weak/unclear/faked*) to 5 (*positive/strong/clear/genuine*). Within-subject ANOVAs were used to compare these ratings across image type for the 32 images used in this study. There was a main effect of image type when predicting valence, intensity, and genuineness (see Table 3). Participants rated neutral faces as more positive and genuine compared to fear, disgust, and sad faces. Participants also rated fear faces as more intense than sad and neutral (but not disgust) faces.

Special care was taken to ensure that the stimulus displays used in Study 2 were similar to that of Study 1, with the primary difference being the use of facial expressions instead of emotion-eliciting stimuli. A total of eight displays presented four facial expression images (fear, disgust, sadness, neutral) from the same model. These displays were presented in two blocks resulting in 16 total trials. Similar to Study 1, each image was resized to 320 × 260 pixels which equates to a 10° × 9° visual angle at a 60 cm viewing distance. The images were displayed in each corner of the screen. The distance from the viewing point to the image was approximately 7°. The vertical distance between images was 8° and the horizontal distance between each image was 12°. The image location was randomized and balanced (i.e., each image type was presented in each corner an equal number of times) within each block. Image location was also randomized across blocks, while keeping the distance from the initial fixation point balanced. All stimulus displays used in this study are presented in the supplemental material.

### 3.1.3. Procedure

The procedure was similar to Study 1. Upon arrival at the lab, participants were escorted to a well-lit private room with a Tobii X2-30 connected to a computer. Sessions were run one person at a time. Participants were told that the study concerned how individuals recognized different types of faces. To keep participants engaged in the task, they were told to press the "Spacebar" key when a dark-haired model was displayed on the screen. Participants were seated in a chair 60 cm away from the viewing screen and completed a short calibration procedure, which consisted of following a red dot as it travelled to areas of the computer monitor. Calibration was accepted if the average error was less than 1° visual angle. Participants then completed 6 practice blocks to become familiarized with the procedure.

Prior to each trial, a fixation point represented by a cross-hair was presented in the middle of the screen. Participants were instructed to focus their attention on the fixation point when it appeared. The fixation point remained the only stimulus on the screen for 3000 milliseconds after which the four facial images appeared for 5000 milliseconds (the fixation point stayed on the screen during the image viewing so that the images were the only change in the field of vision). Once the display had passed, the images disappeared leaving only the fixation point and signaling a new trial. This process continued until the block was complete. Participants were then given a short break and began the second block.

After the eye-tracking task, participants completed the same political ideology measure used in Study 1. Mean scores were calculated with higher values indicating greater endorsement of political conservatism ($M = 2.65$, $SD = 0.61$; $\alpha = 0.80$), social conservatism ($M = 2.56$, $SD = 0.65$; $\alpha = 0.81$), and economic conservatism ($M = 2.91$, $SD = 0.67$; $\alpha = 0.60$). Participants also completed standard demographics questions and indicated their political party affiliation. Finally, participants were debriefed, thanked, and awarded extra credit for their time. The study protocol received approval from the research ethics review board at the second author's institution.[8]

### 3.1.4. Attentional engagement indices

The visual attention measure of primary interest in this study was identical to Study 1, with dwell time representing attentional engagement. Similar to Study 1, proportion scores were calculated by dividing the total dwell time for a specific image type by the overall total dwell time across all image types [34].[9,10]

## 3.2. Results

### 3.2.1. Preliminary analyses

A 4 (image type: fear, disgust, sadness, neutral) x 2 (block: first versus second) repeated measures ANOVA was used to examine whether dwell time varied by image type and block. There was a main effect of image type, $F(3, 101) = 6.16$, $p = 0.001$, $\eta_p^2 = 0.16$. This effect was similar for both blocks ($F < 1$) and was not qualified by a type x block interaction ($F < 1$). Planned comparisons indicated that participants

(*footnote continued*)
that additional participants were recruited to help offset anticipated missing data in visual attention indices.

[8] We have reported all measures, conditions, and data exclusions for this study.

[9] Similar to Study 1, exploratory analyses tested whether political ideology was correlated with attentional orientation. All correlations ranged from $rs = -0.11$ to 0.15 and were nonsignificant ($ps < 0.05$). These analyses are available in the supplemental materials.

[10] Findings are consistent whether proportion scores or raw scores are used.

**Table 4**
Bivariate Correlations between Political Ideology and Attentional Engagement by Facial Expression in Study 2.

| | Dwell Time | | | |
|---|---|---|---|---|
| | Fear | Disgust | Sadness | Neutral |
| Political Conservatism | 0.00 | 0.25** | −0.02 | −0.24* |
| Social Conservatism | −0.07 | 0.24* | 0.01 | −0.20* |
| Economic Conservatism | 0.12 | 0.12 | 0.01 | −0.20* |

* $p < 0.05$.
** $p < 0.01$.

displayed a lower dwell time (in milliseconds) for disgust facial expressions ($M = 934$, $SE = 16$) compared to fear ($M = 1021$, $SE = 15$) and neutral ($M = 1035$, $SE = 18$) expressions ($ps < 0.05$). Dwell time for sad facial expressions ($M = 984$, $SE = 16$) did not differ from other emotional expressions ($ps > 0.74$). Similar to Study 1, social conservatism was positively correlated with economic conservatism ($r = 0.48$, $p < 0.001$).

### 3.2.2. Correlations with political ideology

Bivariate correlations were used to examine associations among political ideology and attentional engagement (see Table 4). Greater endorsement of politically conservative attitudes was correlated with greater dwell time for images depicting disgust facial expressions. Greater endorsement of politically conservative attitudes was also correlated with lower dwell time for neutral expressions. Political conservatism was not significantly correlated with dwell time for fear or sadness expressions. When examining social and economic issues separately, greater endorsement of socially conservative political attitudes was significantly correlated with greater dwell time for images depicting disgust facial expressions. Greater endorsement of socially conservative attitudes was also significantly correlated with lower dwell time for neutral expressions. Greater endorsement of economically conservative political attitudes was significantly correlated with lower dwell time for neutral facial expressions, but was not significantly correlated with dwell time for fear, disgust, or sadness expressions.

### 3.3. Discussion

The purpose of Study 2 was to examine ideological differences in visual attention to environmental cues that indicate the presence of a negative stimulus. Given that facial expressions are one way in which people communicate the presence of threat [37], examining links between political ideology and facial expressions depicting different negative emotions provided a novel way to examine these effects. Consistent with disease-avoidance models [12] and findings from Study 1, greater endorsement of politically conservative attitudes – particularly those concerning social issues – was associated with greater attentional engagement for facial expressions depicting disgust and less visual engagement for neutral facial expressions. We did not find evidence for links between political ideology and attentional engagement for facial expressions depicting fear or sadness.

Potentially, associations among political conservatism and attentional engagement for disgust facial expressions may reflect greater concern for environmental pathogen threat. Disease-avoidance models propose that social conservatism serves as a means to reduce contact with potential sources of pathogens. One way those higher in social conservatism may reduce contact with pathogens is by being more visually attuned to cues that indicate the presence of pathogens in the immediate environment. Engaged visual attention to facial expressions depicting disgust may be one way to become aware of environmental pathogens without direct exposure to the contaminated object and experiencing the accompanying physiological arousal. Findings from this study support this model, and suggest that those who endorse greater political conservatism are more visually engaged with information that may indirectly signal pathogenic threat.

Similar to Study 1 and consistent with our hypotheses, the results indicate that ideological differences in visual attention to negative facial expressions were specific to social issues and were not found with measures of economic issues. These findings are generally in line with political theory, which proposes that social (but not economic) conservatism serves as a means of reducing fear, anxiety, and threat [12,30].

## 4. General discussion

Psychologists and political scientists have increasingly recognized the role of emotions in shaping ideology. Current models of political ideology propose that individual differences in response to valenced information are one of the most robust predictors of variation in political attitudes [1]. The central goal of this research was to examine ideological differences in visual attention to different types of negative information, which may provide valuable insight into the origins of different political beliefs. Findings from this research consistently demonstrated systematic differences among political ideology and visual attention to disgusting scenes and cues. In two studies, we demonstrated that endorsing greater support for politically conservative policies – particularly those concerning social issues – is linked with patterns of attentional engagement for images depicting disgusting situations and cues that communicate the presence of something disgusting in the immediate environment. Similar links were not found between political ideology and visual attention to fear or sadness scenes and facial expressions. This pattern largely supports disease-avoidance models of social conservatism, and suggests that disgust-related biases may play a unique role in the formation or maintenance of socially conservative political beliefs.

Links between social conservatism and attentional bias for disgust varied based on whether the target stimulus was the source of the emotion or whether the target stimulus indicated the presence of a negative stimulus in the environment. Whereas greater social conservatism was associated with *less* attentional engagement for images displaying disgusting scenes and objects, social conservatism was associated with *greater* attentional engagement for disgust facial expressions. This pattern of findings may potentially indicate a general motivation to avoid disgusting stimuli. Those who endorse greater socially conservative political policies may be more concerned about avoiding disgusting objects once they are detected as means of reducing the likelihood of coming into contact with harmful pathogens. To aid in this process, these individuals may be more attentive to environmental cues that indirectly indicate the presence of disgusting objects or pathogenic threats, such as disgust facial expressions. Consistent with disease-avoidance theory [12], similar biases were not demonstrated with endorsement of economic policies, suggesting that these processes may be unique to social beliefs and values that promote adherence to group norms, in-group cohesion, and out-group exclusion.

Connecting social conservatism with greater visual avoidance of disgusting stimuli has important theoretical implications. Social conservatism is characterized by a resistance to change [30], and one mechanism that may contribute to resistance to change is avoidance [42]. Findings from this study suggest that participants who more strongly agreed with conservative social policies were more visually avoidant of situations that may elicit disgust. Several socially stigmatized groups, including the homeless [43], obese [44], and homosexuals [44], are rated as 'disgusting' and some evidence suggests that political conservatives are more easily disgusted compared to liberals [21]. Thus, it is possible that socially conservative individuals may experience disgust and subsequent visual avoidance when they encounter a wide range of social information (e.g., encountering a homeless person on the street). The consequent avoidance that accompanies disgust reactions may limit the information gained from these situations, thereby

reinforcing resistance to change [42], negative misconceptions, and negativity biases in attitudes formed about these groups [14].

Establishing links between social conservatism and greater visual attention to environmental cues that signal disgust also has important implications for theory. Social conservatism is thought to be rooted in beliefs that the world is dangerous and threatening [30,45]. Although this may be interpreted as a hypersensitivity to fear, recent research has shown that inducing disgust results in stronger endorsement of dangerous world beliefs compared to a neutral condition, and that beliefs in a dangerous world mediated links between disgust sensitivity and socially conservative values [46]. Thus, it is possible that greater visual attention to environmental signals that indirectly indicate disgusting stimuli are in the immediate environment may increase perceptions of the world being dangerous, which may facilitate greater social conservatism.

Results from this study should be taken in light of certain limitations. Data were correlational and do not allow for causal inferences. Experimental manipulations are needed to determine causal links between attentiveness to disgust and political ideology. Although acceptable, the economic conservatism scale used in this research demonstrated low internal consistency. Future research is needed to assess a wider range of conservative economic policies, including beliefs about free trade and deregulation of the economy. Additionally, in Study 2, stimuli involved only facial expressions that were directed toward the perceiver. Although findings were consistent with theory, participants may have interpreted that they were the target of the expression and source of the emotion [47], and not that the emotion-eliciting target was present in the immediate environment. Future research is needed to replicate these findings with images depicting facial expressions directed away from the perceiver.

Although simultaneously presenting participants with multiple negative images provided an important methodological control to account for general negativity biases, it is unclear how often these situations are presented in real-world settings. Future research may benefit from utilizing eye-tracking measures that allow data acquisition within real-life situations. Further, effect sizes for ideological differences in visual attention were relatively small. Replicating these findings across multiple laboratories would be a fruitful area of future research. Additionally, our findings consistently indicate ideological differences in visual attention to disgust when multiple sources of negative information are presented simultaneously. However, there may be circumstances where ideological differences in attention to other negative stimuli (e.g., fear) are prioritized, such as when disgusting stimuli are not present. Future research should examine whether ideological differences in attentional biases vary based on the configuration of negative information displayed.

Despite these limitations, findings from this study provide important, novel insight into the role of emotion in political beliefs. This is relatively new area of inquiry, especially with regard to disgust, and there are very few studies that have utilized eye-tracking methods. Demonstrating ideological variation in the type of information that sustains attention helps elucidate the processes responsible for different political viewpoints. Theorists seeking to elucidate the intersection between emotion and political ideology should consider incorporating differences in attentional biases for emotion-related information into their models, and how these differences may contribute to variation in social perception.

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