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The Relationship Between Ideology and Disgust Sensitivity

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THE RELATIONSHIP BETWEEN IDEOLOGY AND DISGUST SENSITIVITY

by

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IDEOLOGY AND DISGUST SENSITIVITY

APPROVAL PAGE

This dissertation was submitted by Shaina C. Fieldstone under the direction of the Chairperson of the dissertation committee listed below. It was submitted to the College of Psychology and approved in partial fulfillment of the requirements of the degree of Doctor of Philosophy in Clinical Psychology at Nova Southeastern University.

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DEDICATION

To my sister, Elisabeth, for her unwavering passion to find commonalities when there seem to be few. Thank you for doing everything before me with grace and pragmatism. You are my ultimate model. I love you.

To future voting Americans, including my children, Hayes and Isaac. May you make civic decisions based on "gut," yet guided by cognition and knowledge.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

THE RELATIONSHIP BETWEEN IDEOLOGY AND DISGUST SENSITIVITY

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NOVA SOUTHEASTERN UNIVERSITY

Abstract

The aim of the current paper is to examine the association between ideology and disgust sensitivity. Studying disgust offers psychologists an opportunity to assess how judgments have evolved over time due to a "gut" sense of danger. This emotion also plays a role in moral judgment: individuals label moral wrongdoings as disgusting which elicits a specific facial expression. For this reason, disgust has recently been found to be a plausible emotion involved in political decision-making. Studies indicate that liberals and conservatives rely on respective moral foundations that influence their choices. Haidt et al. (2009) argue that liberals' views on morality are based primarily on harm/care and fairness/reciprocity, whereas conservatives' views on morality show a more even distribution across the foundations, including those endorsed by liberals, as well as ingroup/loyalty, authority/respect and purity/sanctity. Schnall et al. (2008) suggest a causal relationship between feelings of disgust and moral convictions. People often rely on moral reasoning when they do not have an intuitive response or when their intuition is conflicting. The current study examined this complex relationship by assessing disgust sensitivity while simultaneously manipulating emotional state through the use of emotionally disgusting and neutral pictures. Electroencephalographic (EEG) event-related brain potentials (ERPs) were used as the primary index of emotional processing. The results indicated a main effect for electrode site location and for picture image, as

expected. Results did not show an interaction between disgust sensitivity and ideology, or any mediating factors, suggesting that there may be no statistically significant differences in disgust sensitivity between liberals and conservatives. These results suggest that the core differences between conservatives and liberals may be exaggerated. Limitations and directions for future research are discussed.

CHAPTER I

Statement Of The Problem

Disgust is commonly recognized among researchers as a core emotion (Tybur, Lieberman, & Griskevicius, 2009). Schnall (2008) and Haidt's (2007; 2004) studies posit that when people make an intuitive judgment they also have an emotional "gut" feeling, referred to as disgust. Historically, disgust has been thought of and studied as an essential process involved in distinguishing harmful substances for purpose of survival (Rozin, Haidt, & Fincher, 2009). A detailed definition and discussion of disgust is provided in Chapter II. More recent research has shown how disgust influences morality through the avoidance or deviation from social norms (Royzman & Kurzban, 2011; Rozin et al., 2009; Russell & Giner-Sorolla, 2013). While studies suggest a link between disgust sensitivity and morality, less is known about how disgust sensitivity impacts political decision-making and self-reported ideology.

To better understand the relationship between disgust and ideology, it helps to look at research on moral values. John Haidt applied his theory on moral foundations to ideology and found that conservatives and liberals rely on a different set of morals (Graham, Haidt, & Nosek, 2009; Haidt & Graham, 2007). While Haidt provides insights into core differences between ideologies, his research does not explore the role disgust might play as a core/physiological factor. Fortunately, Inbar et al. (2008) took this theory a step further by applying self-reported ideology to the disgust emotional process. His studies found that via questionnaires conservatives report more disgust sensitivity than liberals; and further, that induced disgust influences judgments (Inbar, Pizarro, & Bloom, 2008, 2012; Inbar, Pizarro, Knobe, & Bloom, 2009).

These results raise interesting questions regarding the relationship between disgust and moral decision-making, particularly concerning how and why people vote along party lines. Do people make political decisions based on complex decision-making, a higher ordered cognitive process, or do they go with their "gut" reaction? How much does an emotional physiological reaction such as disgust influence peoples' decisions?

Moral decision-making is a complex process as there is sometimes a discrepancy between intention and following through with planned behavior (Ajzen, 2001). Information presented outside of consciousness can still influence decisions (Greene & Haidt, 2002). Ong et al. (2014) found that disgust sensitivity moderates the relationship between priming disgust and moral judgments, showing how both reason and higher order thinking, as well as more subliminal facets such as emotions, affect moral judgments. Therefore, disgust could be thought of as a more subliminal influence on decision-making. For this reason it is important to not only consider how people view themselves, but also to examine implicit attitudes and emotions in connection with actual behavior that may influence judgments.

While individuals self-identify as liberal or conservative, less is known about what informs this self-identification and how it maintains stability over time. Research on contrasting political views has been disputed for as long as politics has been studied. Most assume that political orientation is related to environmental factors such as socialization (Hibbing, Smith, & Alford, 2014); children often have values and voting patterns similar to their parents. In contrast, more recent research has shown parental socialization and sociodemographic variables have only a small effect on political orientation (Hibbing et al., 2014; Plutzer, 2002). Research has begun to postulate that

psychophysiological differences influence superficial correlates between conservatives and liberals (Hibbing et al., 2014). This makes a good argument for why research should then focus on psychophysiological differences in order to determine underlying variables between ideological identifications. Physiological differences are reasonably stable over a life span (Cohen & Hamrick, 2003; De Weerth & Van Geert, 2002) similar to political orientation; this stability is unlike socialization, which changes with environment and age. Due to disgust's influence on moral decision-making and its ability to be tested using psychophysiological measures, it is an appropriate physiological area to study.

Disgust can be examined in various ways, including: self-report, facial expression or through psychophysiological means such as brain measures. Various studies have looked into disgust responses, most using self-report measures and few using the latter psychophysiological measures. Psychophysiological measures have the ability to capture a response faster and therefore more implicitly when compared to how individuals think or evaluate themselves (Luo et al., 2013; Moll et al., 2005). Through electroencephalogram (EEG), studies can examine the strength of a person's response over time, unlike other brain measures. Neuroimaging such as fMRIs have had difficulty measuring specific and complex brain processes such as cognition, while event-related potentials (ERPs) use a continuous measure that permits researchers to examine these complex pathways (Luo et al., 2013). Luo et al. (2013) examined the difference between core disgust and moral disgust through ERP components using individuals' reactions to lexicon images. This study found that core disgust was a more sensitive measure than moral disgust alone. Luo et al. used words in order to measure disgust, and while emotional words trigger a larger ERP response than neutral words, images have been

shown to be an even more sensitive measure (Azizian, Watson, Parvaz, & Squires, 2006; Simos & Molfese, 1997). Therefore, measuring core disgust sensitivity through an ERP component is a promising method to determine whether disgust is an underlying difference between self-identified ideologies.

Research Goals and Questions

There are few empirical studies that examine the relationship between disgust and ideology, and even fewer that show these influences through psychophysiological measures. The integration of social psychology with neuroscience is a rising area to be studied. This study proposed to examine how a brain measure, specifically ERP response, was influenced by disgust sensitivity and how that could be moderated by ideological factors.

The first objective of this study was to examine whether disgust sensitivity differs based on ideology using different EEG electrodes. Figure 1 illustrates the interaction model. Was there a main effect for ideology? Was there a main effect for disgust sensitivity? Was there an interaction between disgust sensitivity and level of ideology shown from EEG electrode locations?

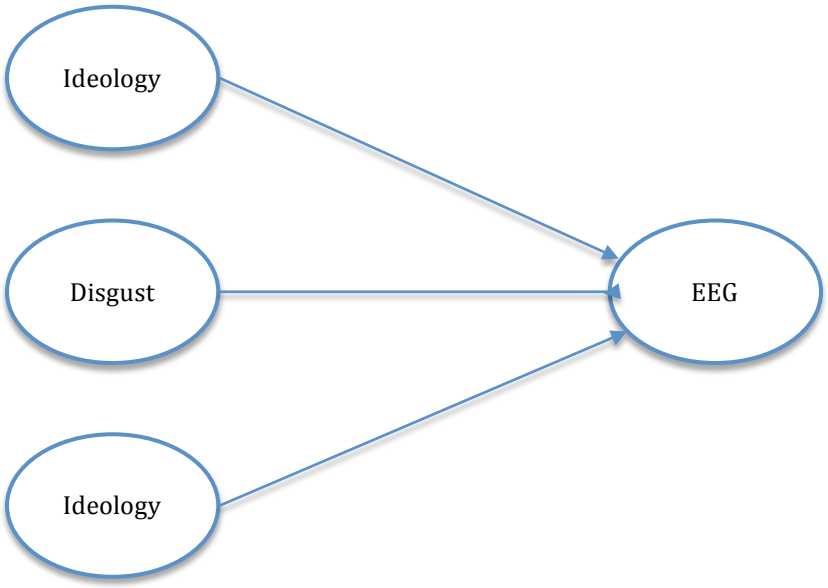

Figure 1. Interaction Between Disgust Sensitivity and Ideology. Ideology is measured by self-identified extremely liberal or liberal and extremely conservative or conservative. Disgust is measured by the images shown during EEG. EEG is measured at each electrode location: FZ, CZ, PZ, C3 and C4.

The results of the first objective could have been due to potential mediators. For this reason the second objective focused on whether Haidt's pillars of morality mediated the relationship between ideology and disgust sensitivity. Figure 2 illustrates the mediation model.

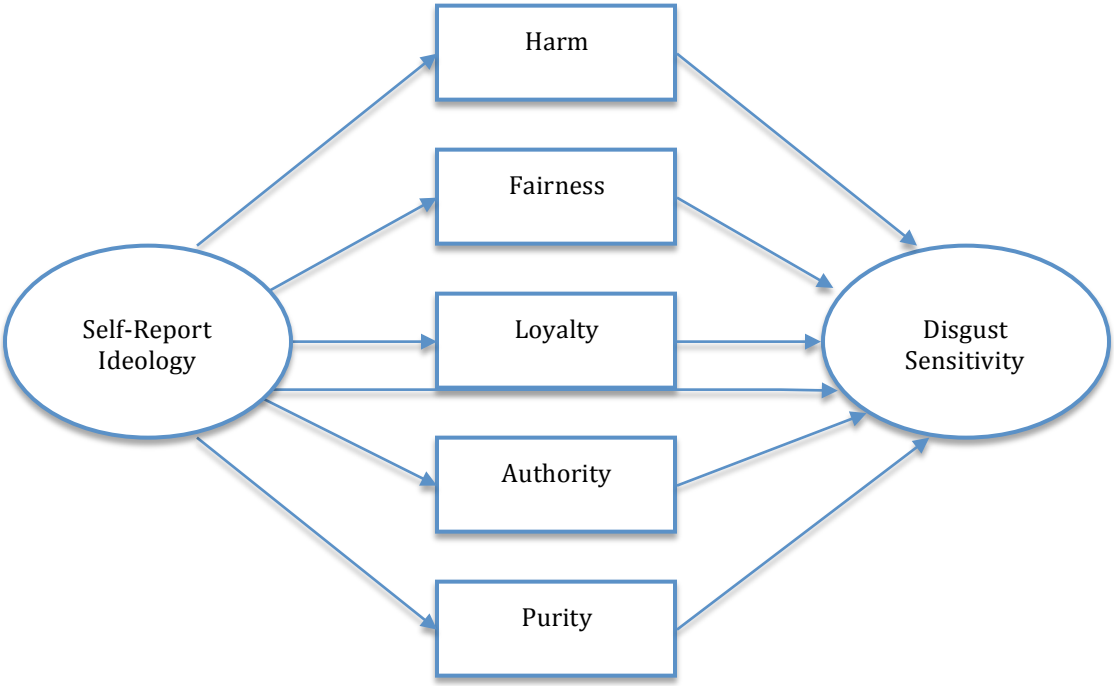

Figure 2. Five Pillars of Morality. Ideology is measured by self-identified extremely liberal or liberal, extremely conservative or conservative. The five potential mediators are continuous variables from the Moral Foundations Questionnaire (MFQ-30). Disgust sensitivity will be determined by the five ERP electrode locations.

CHAPTER II

Review Of The Literature

The present study rests at the intersections of several bodies of literature: disgust, moral psychology, political polarization and the psychophysiological measures used to study these facets. After exploring all of these areas individually, the relationship among these bodies of research will be explained.

History of Disgust Literature

Disgust has an extensive history in both culture and literature. The study of this negative emotion dates back prehistorically to when humans reacted to particular foods with disgust for the purpose of self-preservation (Chapman & Anderson, 2012). The evolutionary function of disgust is to prompt humans to avoid substances of harm: for example, not eating specific foods for fear of poisoning. In ancient times when science was less developed and less popular, disgust reactions were maintained through superstition, religion or societal demands (Rozin et al., 2009). Currently, even though there are scientific advances to determine which objects may be harmful to the body and perhaps soul, people interestingly remain disgusted to harmless substances (Chapman & Anderson, 2012, 2013; Eskine, Kacinik, & Prinz, 2011; Rozin et al., 2009). In contrast, some people appear to move past this reaction into a more complex cognitive process.

Disgust as a Core Process

Disgust is commonly recognized among researchers as a core emotion, which elicits a universal facial expression (Ekman, 1993; Tybur et al., 2009). Rozin et al. (2009) discussed three core principles that are required to induce a disgust response: a sense of contamination, oral incorporation and vulgarity. The mouth is especially sensitive to

threat cues of contamination because it is the primary entrance to the body (Russel, 2009). This is perhaps why disgust's facial response is particularly focused on the nose and mouth. Further, disgust is often thought of as a "gut" reaction (Schnall et al., 2008) or a "yuck" feeling (Russel, 2009) because of its connection to nausea. Compared to other emotions, it engages the activation of the gastrointestinal system. Bodily reactions to an event may become well learned to such an extent that when people solely think and are not in direct contact with a disgusting event they can still become nauseated (e.g., thinking about vomit can cause nausea) (Chapman & Anderson, 2012; Schnall et al., 2008). The evolutionary purpose of this reaction is to ward off disease and infection to protect the human species (La Rosa & Rosselló Mir, 2013)

There has been much debate with regard to the specific facets of disgust. A response of disgust can be induced by a range of events, from pathogens (such as infectious microorganisms) to morality (relating to the avoidance of deviations from social norms) (Tybur et al., 2009). More precisely, a person, object or situation that could result in contamination to the body activates an avoidance strategy triggered from a disgust response (Terrizzi, Shook, & Ventis, 2010). The response is most typically triggered by bodily matter (e.g., feces, vomit and blood) (Bloom, 2004, Rozin 2000, Inbar 2011). Then, the response is illustrated by specific facial features, the physiological reaction of nausea/gagging, and an overall avoidance of what triggered the response. Core disgust is not solely based in taste, but in the possibility of the item being contaminated, and therefore, harmful to the body (Eskine et al., 2011; Rozin et al., 2009). For this reason, core disgust is presumed to be comprised of byproducts of both the body and animals, as these are potentials for food. Researchers dispute whether core disgust

includes other facets such as "animal reminder," which refers to the extent to which an act reminds people that they are in fact animals, while they wish to be elevated from this status (e.g., when people excrete it reminds them that they are animals). Animal reminder disgust also includes a disgust of death (e.g., the decaying odor of a dying animal). Many scales examine statistically whether there is discriminant validity to these sub facets of disgust. The Disgust Emotion Scale (DES) measures five core facets of disgust: rotting foods, blood and injection, smells, mutilation and death, and small animals (Kleinknecht, Kleinknecht, & Thorndike, 1997), while the Disgust Scale-Revised (DS-R) measures three key factors of disgust: core, animal reminder and contamination (Haidt, McCauley, & Rozin, 1994).

Disgust has evolved disparately in different cultures and can account for diversity among what is considered socially normal in various groups. Exemplifying this is how transgendered individuals are viewed with disgust in some Western regions, while they are considered with respect and even power in other, more Eastern regions.

The boundaries are unclear between disgust as a physical versus moral manifestation. Evolutionarily it fits clearly within the realm of physical, as in protecting the body from disease and harm. Morally, what would it protect individuals from? Straying away from culture to maintain a social norm?

Morality and the Moral Foundations Theory

Morality is almost as old a topic as disgust. It likely dates back prehistorically, recorded as far back as Mesopotamia and evolving through Western philosophy associated with thinkers such as Aristotle and Plato (Haidt, 2008) and through Eastern philosophy with names such as Confucius and Lao Tzu. In terms of psychological history,

the father is thought to be Piaget (Haidt, 2008), then later Kohlberg and Gilligan (Haidt, 2013). John Haidt can be added as a contemporary name, in that he has been able to integrate past philosophers' and moral psychologists' theories with contemporary research questions.

Building on the work of these earlier moral psychologists, Haidt and colleagues developed the Moral Foundations Theory (Haidt & Graham, 2007; Haidt & Joseph, 2004) and examined its relevance to political ideology. This group examined individuals' moralities across five domains: harm/care, fairness/reciprocity, ingroup/loyalty, authority/respect and purity/sanctity. Three foundations originated from Shweder, Kohlberg and Gilligan's presumptions on morality, and then Haidt et al. expanded on contemporary ideas of justice.

Five moral foundations. *Harm/care* is exemplified as a natural human sensitivity toward the suffering of their kin. This area is thought to build compassion, as well as praise for those who reject and stop harm to others (Haidt & Graham, 2007). Through *Fairness/reciprocity* individuals feel emotions when observing others engaging in community. This pillar has been thought to specifically affect progress in human rights in societies where striving towards equality is a core value (e.g., U.S. or Europe). While many societies reside together on a hierarchical structure, fairness is often still a built-in virtue. This facet could also be interpreted as justice. The *Ingroup/loyalty* pillar is the idea of trusting your own kin and own group while distrusting others. The value of fighting for a group while punishing those who betray this group is common in many cultures (e.g., Europe or Japan). *Authority/respect* is based on historical societies where most live in hierarchical structures (e.g., India, China or Great Britain). People are taught

to respect those who are in authority positions, despite their other characteristics. The *Purity/Sanctity* pillar has been historically linked to disgust. People elicit a disgust response towards impurity, such as anything disease ridden, as well as acts often linked to the body. Literature has shown a particular interest in how purity influences disgust and therefore ideology. Historically, people try to protect the purity of their bodies, as there is an evolutionary reason to be clean and free of disease. Purity is unique among the five pillars, as it is a social function rather than a value. (Schnall, 2011).

Applied research of the five pillars. In Haidt's (2007) results, which used four different methodologies, he found evidence that liberals' views on morality are based primarily on the pillars harm/care and fairness/reciprocity; whereas, conservatives' views on morality demonstrated a more even distribution across the foundations including those endorsed by the liberals, as well as ingroup/loyalty, authority/respect and purity/sanctity (refer to Figure 3) (Graham et al., 2009; Haidt, 2008). These results show that some stereotypes by social psychologists with regard to conservatives may be misguided. Both conservatives and liberals act on moral motives, even if they do not adhere to the same values (Haidt & Graham, 2007).

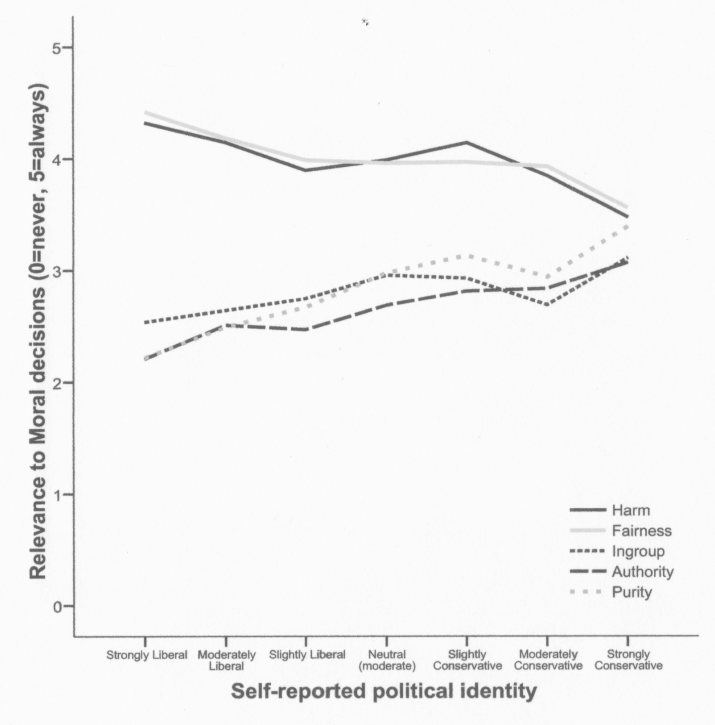

Figure 3. Liberals and Conservatives Distribution Across the Five Pillars. Taken from "Liberals and Conservatives Rely on Different Sets of Moral Foundations," by Graham et al., 2009, *Journal of personality and Social Psychology, 96*(5), p. 1033.

Further, with regard to all five pillars there is recognition that morals are culturally constructed. These foundations have been used to explain the cultural divide in the United States, as well as other countries, especially in connection with the Presidential elections in the United States in the second half of the Twentieth Century through to the 2016 Presidential election.

The moral foundations theory provides a way to conceptualize what values are utilized among Americans living in the United States when making political decisions, and has been both well-tested and used in a variety of studies examining ideology.

Schnall et al. (2008) found a causal relationship between people's feelings of disgust and their moral convictions. People refer to others' immoral actions as disgusting and even sickening (Royzman & Kurzban, 2011). People often rely on moral reasoning when they do not have an intuitive response or when their intuition is conflicting (Schnall et al., 2008). Affective processing, such as disgust, is often involved in this intuitive response and then is later explained using moral reasoning. In general, and perhaps obviously, people prefer what they feel good about and do not prefer what they feel badly about (Schnall et al., 2008). Schnall et al.'s (2008) study along with Haidt's moral foundations theory (Haidt & Graham, 2007; Haidt & Joseph, 2004) posit that when people make an intuitive judgment they also have a "gut" feeling about it. Affect consequently affects judgments.

Because studies suggest that disgust mitigates moral reasoning, it is important to consider what the literature tells us about the role disgust might play in the particular type of moral reasoning involved with ideological choices. Inbar et al. (2008) explored how disgust influences voting patterns in liberals and conservatives. Generally, liberals believe that engaging in disgusting behaviors, whether sexual or oral, are only considered immoral when another person is harmed by the behavior (Inbar et al., 2008) fitting with the pillar harm/care. Disparately, conservatives value purity more than liberals, and thus when an act is considered disgusting it is also considered immoral (Haidt & Graham, 2007; Inbar et al., 2008), such as acts of homosexuality. Other studies have shown that individuals with higher reported disgust sensitivity have more negative views of certain social groups (Inbar et al., 2009) indicating a physiological influence for Haidt's moral pillar of ingroup/outgroup. Further, reported disgust sensitivity (mainly contamination

disgust) has also resulted in having more negative attitudes toward groups that oppose traditional sexual morality (e.g., pro-choice advocates), and more positive attitudes toward groups that defend traditional sexual morality (e.g., Evangelical Christians) (Crawford, Inbar, & Maloney, 2014). Since conservatives vote in line with these values, it's inferred that they would value loyalty and purity more than liberals. Inbar et al. (2012) have also researched how the influences of disgust can shift moral judgment. His group found that participants exposed to a disgusting odor reported more negatively about gay men. This study showed an actual change in views based on the induction of disgust; this result was similar for conservatives and liberals. Similarly, studies have also shown that clean smells move behavior in a prosocial direction, while an odorous smell influences people to judge more harshly (Schnall, 2011).

Ideology and Political Polarization

The disparity of ideological ideals is assumed to be global and across time (Hibbing et al., 2014). For example, an accepted difference is that people identifying as conservatives are more likely to contest social change and be more tolerant of inequality, while people identifying as liberals are more likely to accept social change but be more disturbed by inequality (Hibbing et al., 2014). Other examples are illustrated in the section above.

There has been growing debate about party polarization in contemporary American politics since the Cold War (Abramowitz, 2010). Presidential elections have been close and the Nation has been called divided, even being labeled as undergoing a "culture war" (Fiorina, Abrams, & Pope, 2010). On one end of this debate, there are political analysts such as Alan Abramowitz, who use data collected from the American

National Election Studies to look at trends in voting patterns (Abramowitz, 2010, 2013). He argues that there has been an increase in the divide among U.S. voters along racial, geographic, cultural, and ideological lines and that the bipartisanship in Washington (both the House and the Senate) do in fact reflect the disparity within the electorate (Abramowitz, 2013). With this polarization has come a loyalty for the identified party and a negative view of the opposing party.

On the other end of this debate are analysts, such as Morris Fiorina, who contend that most Americans are moderate and have similar views on most ideological issues (Fiorina et al., 2010). Although the country could be interpreted as a 50-50 nation with a small number of moderate voters that swing an election, Fiorina argues that it could also be interpreted as the inverse: most people are moderate and the few extreme voters swing elections. Fiorina explains that there appears to be an exaggeration of differences due to a few matters. Significantly, voting is compressed into a dichotomous position and therefore becomes a polarizing issue (Fiorina et al., 2010; Westfall J., 2015). Even while many people are "on the fence" during elections, this is not represented in their final decisions. Although the "political class" (people active in local, state and national politics) is clearly polarized, this is not representative of mainstream citizens. Additionally, the media interviews and interprets politics with the political class and not usually with mainstream Americans. In actuality, citizens with strong ideological positions do not always vote based on that one position. For example, 37% of gun owners typically expected to vote Republican, in fact, voted for John Kerry (Fiorina et al., 2010).

If core differences (e.g., psychological or physiological) exist among conservatives and liberals, what is their derivation and how can they be studied?

Historically, it's been assumed that differences between ideological identification are a facet of socialization, influenced mainly by environmental factors. However, studies have shown that adding demographic variables such as age, years of education, and income to models of political attitudes or behavior only increases effect size modestly (Hibbing et al., 2014; Plutzer, 2002). Interestingly, as early as the 1980's, studies showed high heritability estimates on ideological issues (Bell, Schermer, & Vernon, 2009; Hatemi, Alford, Hibbing, Martin, & Eaves, 2009; Hatemi et al., 2011; Hibbing et al., 2014). Though it has been accepted that physiological and psychological traits are quite constant across time, few have looked at these factors in relation to ideological attitudes (Hibbing et al., 2014). If ideology and even patterns of voting on political issues were based in physiological and psychological facets, then they would be stable as well. This approach seems like a plausible way to look at differences that are not simply self-identification but core differences.

Disgust, Morality and Their Influences on Ideology

As mentioned, literature and political commentary have discussed the "culture war" within the United States, as well as other societies' political atmospheres. This clash of morals on the extreme sides of the political spectrum has brought social issues into the forefront of voter's attention and influenced elections. Political scientists and psychologists have examined why people tend to side with a position that was proposed by their self-identified political party (Koleva, Graham, Iyer, Ditto, & Haidt, 2012; Malka & Lelkes, 2010). In other words, how much weight is placed on identity versus ideology? Are there coherent issues that divide the parties and create this "culture war?" Many believe that morality is a less researched area that could underlie this divide (Koleva et al.,

2012). Koleva et al. examined how the five pillars of moral foundation predict disapproval and support on political issues, and posit that the moral foundations model (Graham, Haidt, & Nosek, 2008) is useful in determining a person's position. This group discusses how although morality explains a piece of what underlies political decision-making, there is much left to be answered.

How does disgust specifically tie into ideology? Because disgust is an emotion, does this mean its response is innate and less reactive to higher-order thinking? Does this further indicate that disgust would become apparent on psychophysiological measures, especially brain measures?

Specifically, studies have looked at self-reported ideology and found that liberals perform better on tasks of mental flexibility (because this measure is a time related task it is considered neurophysiological in nature) (Thórisdóttir & Jost, 2011). In terms of specific pillars, authority and the idea of threat have been shown as an area that influences politics. Especially post the 9/11 terrorist attacks, ideology has been influenced by a need to reduce uncertainty (Jost, Glaser, Kruglanski, & Sulloway, 2003). Additionally, harm and fairness have been assessed in a more recent study examining physicians' morals and effects on healthcare costs (Antiel, Curlin, James, & Tilburt, 2013). Antiel et al. (2013) found that harm and fairness could help explain physicians' agreement with cost-containment when compared to the other pillars. Furthermore, purity and authority have been examined as moderators when judging influential people; these results showed that judgments were actually similar for both liberals and conservatives (Frimer, Biesanz, Walker, & MacKinlay, 2013). A study examining the ingroup and outgroup pillar discovered a greater intergroup disgust sensitivity predicted attitude

towards outgroups such as immigrants, low SES or marginalized groups (Hodson et al., 2013).

While many of the five pillars have been studied, Koleva's (2012) analysis reveals how purity is a bigger indicator of political decision-making than that of the other pillars, as it is especially correlated with issues such as same-sex marriages, abortion and stem-cell research, all polarizing political issues in the United States. Given that purity is of high importance in many political issues and that it is often linked to disgust in origin, this shows the relevance of examining disgust as a facet of ideology. Disgust offers psychologists and neuroscientists an opportunity to examine how judgments have evolved over time due to a "gut" sense of danger. As shown in the previous section, disgust plays an important part in moral judgment as well, perhaps through this influence on purity (Horberg, Oveis, Keltner, & Cohen, 2009; Ong et al., 2014; Rozin et al., 2009). Studies have shown that individuals label moral wrongdoings as disgusting and that they even elicit a specific facial expression (Danovitch & Bloom, 2009; Hutcherson & Gross, 2011). A growing number of studies have researched how participants evaluate more harshly after an elicited disgust response (Inbar et al., 2012). For example, participants have been exposed to disgust in a range of versions: images, clips, smells and taste, and in each of these situations have shown harsher moral judgments (Eskine et al., 2011; Horberg et al., 2009; Inbar et al., 2012; Schnall et al., 2008). Schnall et al. (2008) found a link between feeling physically disgusted and a moral response. Specifically, their study showed how disgust in particular influenced moral judgment and had discriminant validity when compared to other emotions such as sadness. Further, it revealed that there are different levels of disgust sensitivity. This finding raises the question as to whether

this stronger disgust response affects moral judgments that play a role in political decision-making, such as whether to vote for a particular candidate or identify with a specific party.

Moral disgust remains a more controversial issue in the literature. Core disgust is an adaptive process that does not depend on more complex processes such as judgment or cognition. In contrast, moral disgust does involve higher order systems such as cognition (Luo et al., 2013). There is the ongoing question of whether moral disgust is its own construct or a subset of disgust. If it is a subset, then what are the other facets of core disgust? Did disgust originate for the purpose of protection from harm and then develop into a social construction? In this way it's presumed that thoughts, values and human actions become disgusting and elicit similar bodily responses to that of core disgust. If disgust was developed differently in diverse cultures, does this influence their current moral domains? This then brings up issues of generalizability, and thus influences the study question (and the creation of questionnaires and their validity).

Influences on the Brain

This section seeks to explore the neurological underpinnings of core disgust (pathogen/physical) and morality (moral disgust/moral judgment). Below is a discussion of two methods researchers have used to investigate the neurological processes and pathways of disgust and morality, fMRI and ERPs, and why this study utilized the latter. This exploration will help justify the research objectives and the measurements used to examine them.

fMRI. Disgust has been implicated in many neurological pathways and processes. Specifically, fMRI studies have shown that viewing images of disgust is strongly

associated with activation in the amygdala, occipital cortex, prefrontal cortex, basal ganglia and anterior insula (Fitzgerald, Angstadt, Jelsone, Nathan, & Phan, 2006; Moll et al., 2005; Sambataro et al., 2006; Sprengelmeyer, 2007; Stark et al., 2005; Stark et al., 2007; van Nunspeet, Ellemers, Derks, & Nieuwenhuis, 2014). Meta-analysis in a study on facial expressions and on neuroimaging of emotion suggests that the two areas most implicated in disgust are the insula and amygdala (Chapman & Anderson, 2012). In addition to contemporary studies, research as far back as Penfield's experiments confirms that the insula is involved in the process of gustation and olfaction, processes closely involved in the disgust sensory process. Moreover, the facial expression of disgust is associated with the activation of the anterior insula. It is presumed that the insula could influence how much the amygdala attends to the emotional information of disgust or fear (Chapman & Anderson, 2012). Remarkably, vicarious disgust has also been represented in the insular and mid-anterior cingulate cortex, suggesting that the brain acts similarly when an individual personally experiences disgust stimuli or is watching the responses of others (Chapman & Anderson, 2012; Corradi-Dell'Acqua, Tusche, Vuilleumier, & Singer, 2016). The evolutionary nature of disgust might be explained by the fact that the regions associated with this emotion are subcortical.

There has been ongoing skepticism as to whether "moral disgust" exists separately from "pathogen disgust." Evidence begins to suggest that core disgust and moral disgust have common as well as unique neural networks. In Schaich et al.'s (Schaich Borg, Lieberman, & Kiehl, 2008) fMRI study examining the overlapping regions of core and moral disgust, the common neural regions were found to be the medial prefrontal cortex, areas in the left temporal lobe, basal ganglia, amygdala and

anterior cingulate (Schaich Borg et al., 2008) with more activity in the medial prefrontal cortex for moral acts and more activity in the amygdala for core disgust acts. Other researchers have confirmed that moral disgust has been correlated with pathways associated with regulating social behavior such as the medial prefrontal cortex, the anterior orbitofrontal cortex, areas of the right temporal and frontal gyrus and the left piriform cortex (Greene & Haidt, 2002; Luo et al., 2013; Moll et al., 2005). In summary, fMRI studies and other psychophysiological measures have shown that there are both unique neural substrates associated with physical disgust and moral disgust as well as a neural overlap between the constructs. Because fMRI studies have been inconclusive, this study investigated another measure: the Event Related Potential (ERP) component Late Positive Potential (LPP).

Late Positive Potential Event Related Potentials (LPP ERPs).

Electroencephalogram (EEG) measures electrical activity in the brain by recording the signals of electrodes placed on the scalp. When the EEG measures the direct result of a cognitive or emotional event the resulting voltage change over time are the Event-Related Potentials (ERPs) (Hajcak, MacNamara, & Olvet, 2010; Luck, 2014). In contrast to fMRIs, which measure brain activity associated with blood oxygenation, ERPs directly represent brain activity. Compared to other brain measures ERPs have poor spatial resolution, but they have excellent temporal resolution; its ability to track the time course of processing to the millisecond is its main advantage (Luck, 2014). ERPs are also less invasive and less expensive than fMRIs. Another advantage of utilizing ERPs over other psychophysiological emotional measurements (e.g., facial EMG, skin conductance or heart rate) is that the ERPs can account for emotional habituation (Hajcak et al., 2010).

ERP studies often assess emotional stimuli compared to neutral stimuli to offset this difficulty (Luck, 2014). In addition, ERPs are consistent over time within individuals (Codispoti, Ferrari, & Bradley, 2006).

ERP components are described by Luck as "a scalp-recorded neural signal that is generated in a specific neuroanatomical module when a specific computational operation is performed (Luck 2014, page 66). ERPs can process emotional information by analyzing the amplitude and timing of the ERP components (Olofsson, Nordin, Sequeira, & Polichc, 2007). According to Luck (2014), the two emotion-related components that have been researched most frequently are the *early posterior negativity* and the *late positive potential*. The *early posterior negativity* is in the N2 latency range; it is a negative potential that is enhanced for stimuli which induces emotion. The *late positive potential* (LPP) is a positive voltage that is apparent after approximately 300 milliseconds of exposure to stimuli and can facilitate the attention of affective stimuli. Though the LPP may extend for hundreds of milliseconds, the initial portion (consisting of an enlarged P3 component) is thought to be an intrinsic reflection of the emotional stimuli and therefore reflect an automatic process (Luck, 2014), especially pertinent to the "gut" response of disgust. The magnitude of the LPP is greater when individuals view emotionally-arousing pleasant or unpleasant (in this case, disgust pictures) compared to neutral stimuli (Schupp, Schmälzle, Flaisch, Weike, & Hamm, 2012). ERP and fMRI studies have shown that the LPP produced by emotional stimuli correspond to increased blood flow to the occipital, parietal and inferior temporal regions of the brain (Sabatinelli, Lang, Keil, & Bradley, 2007). Functionally, the LPP represents downstream cognitive processes resulting from increased amygdala activation, especially pertinent in the study

of disgust. Generally, the LPP might represent the activity of an alert system located in the brainstem that utilizes norepinephrine to innervate areas of the cortex after exposure to emotional stimuli (Hajcak et al., 2010). As disgust is an intensely negative affective response, this study presumed that measuring the LPP ERP component could reveal the extent of disgust sensitivity differing between ideological groups and whether aspects of morality mediate these differences.

ERP studies on disgust and related topics. Few ERP studies have examined disgust, and even fewer have examined morality and ideology. As stated, ERP studies are beneficial in that they allow researchers to examine neural processing implicitly as a continuous measure recorded to the millisecond (Luck, 2014). Since ERPs are particularly good at capturing automatic responses, this tool is especially useful in measuring core disgust, an emotion processed quickly and automatically. Further, brain measures such as fMRIs have difficulty examining processes that are linked to time, such as a cognitive or emotional process.

Several ERP studies have investigated disgust and overlap between morality and core disgust. Yoder and Decety (2014) measured amplitude for components LPP, N1 and N2 (components associated with emotional salience) in order to examine moral judgments,. They found that people differentiate between prosocial and antisocial actions rapidly (based on N1 amplitudes), followed by an affective reappraisal of their decision influenced by their emotional disposition (Yoder & Decety, 2014). They also observed density peaks in the medial prefrontal cortex, fitting with prior studies examining the neural network of morality. They found that morality (usually thought of as a second

order process involving cognition) actually has an automatic component (Yoder & Decety, 2014).

Other research has examined differences in the neural activity between disgust, moral disgust and morality. Yang et al.'s results were similar to Yoder et al.'s, but they assessed emotional processing as well. They found that the evaluation of moral actions was processed prior to that of disgust. Yang et al. (2014) demonstrated that judging morally wrong situations elicited larger positive amplitudes in the 300-400 ms timeframe at frontal scalp sites while physically disgusting situations elicited larger positive amplitudes in the 500-600 ms time frame at the central-parietal scalp sites. These findings are consistent with the fMRI studies that show how moral disgust and core disgust activate unique neural pathways, though this study exemplifies how activations in particular regions can be discernable across time.

Luo et al. (2013) examined the psychophysiological difference between core and moral disgust by recording ERPs while participants performed a lexical decision task. As hypothesized, participants responded more slowly to words provoking moral disgust since it involves a more complex cognitive process compared to core disgust (Luo et al., 2013). Words related to core disgust obtained a larger EPN and N320 in the right frontal region as well as a reduced N400, whereas moral disgust obtained a larger N320 in the middle frontal region. Zhang et al. (2015) examined differences between core disgust and moral disgust through recorded ERPs and discovered different neural activities as well. Contrasting to other studies, they found larger amplitudes (at components N1, P2 and P3) for core disgust images, while N2 amplitudes were larger for moral disgust. Wheaton et al. (2013) found LLPs are sensitive to both disgust and threatening images;

this result shows how disgust may be as strong an emotion as fear and that the LPP is especially sensitive to pictures of disgust.

Justifaction for using LPP. Moral disgust has been a debated subject. Neuroimaging research could potentially resolve whether the moral and physical aspects of disgust have a similar neural network. While several studies have utilized ERP components to examine the constructs of morality and disgust, there has been much contradiction. Given that the brain areas implicated in disgust research are not confirmed (compared to other emotions such as fear and sadness), and that researchers have not agreed on an operational definition of moral disgust, this area of study remains unresolved. For this reason, more research and specific studies looking at disgust in conjuction with morality are necessary to determine a clear neural link. This study specifically examined the ERP component LPP because of its ability to consistently be modulated by emotional stimuli (Schupp et al., 2012), including stimuli that might provoke a disgust response. The stimuli in this study consist of intensely disgusting images to produce the most sensitive LPP response and therefore decipher differences between the ideological groups. Because the LPP can represent a process resulting from increased amygdala activation, it is especially applicable to studies of disgust; as mentioned, Schaich et al. (2008) found more activity on fMRI in the amygdala for core disgust acts. As it would be difficult to decipher and validate images representing a moral disgust response, morality is measured through validated self-report questionnaires and these responses will be used to decipher mediators between ideology and disgust sensitivity.

Study Goals and Hypotheses

Based on the literature discussed in this chapter, it was hypothesized that results would indicate a moderation in which conservatives would show more disgust sensitivity on questionnaires and therefore also on ERP electrode locations.

Assuming moderation was found in the primary analysis, a mediational relationship was expected between ideology and disgust sensitivity. It was presumed that the pillars John Haidt developed establish a profile for liberals and conservatives and that this profile would mediate the moderation between disgust sensitivity and ideology. Based on past studies examining ideology, it was hypothesized that purity could be a possible mediator for conservatives, and fairness or harm could be a mediator for liberals.

Post-hoc analyses would be examining mediators even if there were no findings for the first objective. It would still be useful to find that there is a difference between self-reported ideology and disgust sensitivity as measured through a physiological measure. It was further hypothesized that mediators could explain the lack of a moderational effect. For instance, there might be similar disgust sensitivity on EEG for both liberals and conservatives but based on different mediators: for instance, harm or fairness for liberals and purity or authority for conservatives.

CHAPTER III.

Methodology

Participants

The study team (consisting of the doctoral committee and several research assistants all from Nova Southeastern University) recruited participants via online venues such as Craigslist in the South Florida community. Specifically, participants included adults of 18 years of age or older who identify via self-report as either extremely conservative or extremely liberal. Due to the administration of questionnaires and a brain measure, participants must also speak fluent English, be right handed and have no serious psychiatric or neurological illness that could have influenced the EEG findings. Consequently, participants were excluded if they violated inclusion criteria or if they reported the diagnosis of a psychotic or bipolar disorder, current substance abuse or dependence, homicidality, or suicidality as well as mental retardation, dementia, brain damage, or other cognitive impairment.

Regarding sample size, EEG studies are regarded as quite sensitive. Using G power with a General Linear Model (with the pre-specified level of statistical power set to .80, moderate effect size of .25 and alpha error of .05), it was initially thought that a sample size of 34 individuals should be used in the analyses. Due to recruitment difficulties mid-way through data collection, the expected sample size decreased to 25 individuals.

Measures

Numerous self-report questionnaires were administered. The first self-reports gathered participant demographics as well as questions pertaining to ideological values.

The subsequent questions focused on measures of disgust. Lastly, other questionnaires were included for exploratory purposes. Refer to Appendixes A-D.

Demographic questionnaire. Participants were asked their: gender, marital status, age, race/ethnicity, religion and how religious they are (on a five-point scale), education, occupation, where they were born, first language, English verbal proficiency (on a five-point scale) and English written proficiency (on a five-point scale).

Ideology questionnaire. Participants were also asked about their ideology directly in five questions (Treier & Hillygus, 2009; Treier & Hillygus, 2005). Participants were first asked on a seven-point scale their self-reported ideology ranging from very conservative to very liberal. They were also asked their political party, with the ability to identify as a Democrat, Republican, independent, with no party or with other party. Further, due to recent divide in the U.S.' political views regarding economic and social issues, participants were also asked how they identify on both social issues and economic issues on a seven-point scale ranging from very conservative to very liberal. Lastly, participants were asked if they were registered to vote and whom they voted for in the last Presidential election (2012). These political questions have been widely used for obtaining ideological and political affiliations by the Pew Research Center. In addition, a political analyst was consulted to confirm the questions' content validity.

Psychiatric symptom and treatment screen. Participants were asked screening questions regarding psychotic symptoms, neurological problems, cognitive impairments, whether they have been hospitalized for any of these conditions and if they were on medication. These questions were asked because some medications and syndromes are contraindicated with the EEG.

Moral Foundations Questionnaire – 30 (MFQ30). The MFQ30 is a 30-item questionnaire measuring morality through five pillars: harm/care, fairness/reciprocity, ingroup/loyalty, authority/respect and purity/sanctity (Graham et al., 2008). Participants (n = 2,212) were pulled from the Project Implicit and were asked to what extent they agree with a variety of items when deciding if something is right or wrong (Graham et al., 2008). Example items include: "Whether or not someone showed a lack of respect for authority" and "Justice is the most important requirement for a society. " These judgments were self-rated on a six-point scale ranging from strongly disagree to strongly agree. The MFQ30 has been translated into 38 languages (http://www.moralfoundations.org) and been examined in an array of studies assessing its psychometric properties and generalizability (Antiel et al., 2013; Frimer et al., 2013; Inbar et al., 2008). Internal consistency reliability for the five pillars ranged from α =.24 to .74 : α =.50 (harm), α =.64 (authority), α =.39 (fairness), α =.24 (ingroup), and α =.74 (purity) (Graham et al., 2009). Graham et al. (2011) provided evidence for convergent and discriminant validity; each of the five foundations most strongly predicted its conceptual pillar in relation to the other facets (average r = .51 vs. average r = .14). Further, predictive validity was shown as each foundation was the strongest predictor (even while covarying for ideology) of theoretically related social groups that were determined a priori (Graham et al., 2011). Additionally, the MFQ30 provided incremental predictive validity to other measures of morality; when compared to the Schwartz Values Scale, the MFQ30 provided significant improvement to prediction (Graham et al., 2011).

Disgust Measures

Disgust Emotion Scale (DES). The DES is a 30-item measure assessing the five core facets of disgust: rotting foods, blood and injection, smells, mutilation and death, and small animals (Kleinknecht et al., 1997). Example items are worded as: "how much disgust or repugnance would you experience from being exposed to" and gives items such as "an alley cat" or "the smell of human feces." Internal consistency reliability was in the acceptable range: α =.91, while the internal consistency reliability of the five subscales were: α =.89, α =.88, α =.58, α =.84 and α =.59 (Olatunji, Sawchuk, Jong, & Lohr, 2007). The DES demonstrated acceptable convergent validity in relation to the Disgust Scale as well as significant positive correlations between the DES and specific anxiety disorder symptoms such as obsessive-compulsive disorder symptoms and blood injection injury fears (Olatunji, Sawchuk, et al., 2007).

Disgust Propensity and Sensitivity Scale – Revised (DPSS-R). The DPSS-R (Fergus & Valentiner, 2009a) includes 12 statements assessing disgust propensity ("I experience disgust") and disgust sensitivity ("It scares me when I feel faint"). It was developed to assess propensity and sensitivity separately: only containing items that do not have overlapping constructs (Olatunji, Cisler, Deacon, Connolly, & Lohr, 2007). The measure was devised in the Netherlands from two large samples (n = 487 and n = 480). Fergus & Valentiner (2009b) used exploratory and then confirmatory factor analysis and found strong to moderate intercorrelations (r = .59) and good internal consistency reliability (α = .78, α =.77). The two factors on the DPSS-R have also been shown to be a valid measure in assessing disgust as it relates to anxiety disorder symptoms, moderately correlating with contamination and spider fear, while mildly correlating with injection fear (r's ranged from .07 to .37) (Olatunji, Cisler, et al., 2007).

Disgust Scale-Revised (DS-R). The DS-R is a 25-item questionnaire measuring three key factors of disgust: core, animal reminder and contamination (Haidt, McCauley, & Rozin, 1994). The questionnaire contains items such as: "Seeing a cockroach doesn't bother me" and "You discover a friend of yours changes underwear once a week." Participants are asked to answer on a five-point scale ranging from strongly disagree to strongly agree. In a study with 215 college students, internal consistency reliability was found to be at an acceptable range ($\alpha = .87$). The three subscales also demonstrated acceptable internal consistency reliabilities: $\alpha = .80$ for core disgust, animal $\alpha = .82$ and contamination $\alpha = .71$ (Olatunji, Williams, et al., 2007). The DS-R is a valid and widely used self-report to measure differences in disgust sensitivity (Olatunji, Williams, et al., 2007). Additionally, the subscales of the DS-R demonstrated good construct validity when entered as predictors of the DES subscales (betas ranged from .22 to .24); the total DS-R score was also significantly correlated with state anxiety and contamination fears. These findings stayed consistent in a clinical sample ($n = 56$) of patients with OCD as well (Olatunji, Williams, et al., 2007).

Other Self-Report Measures

Anxiety Sensitivity Index – 3 (ASI-3). The ASI-3 was developed by Taylor et al. (2007) to measure the fear of arousing sensations resulting from the belief that something will have a negative consequence. The 18-items scale was developed in a U.S. and Canadian nonclinical participant sample ($n = 2{,}361$) and contains three subscales of anxiety: social concerns, physical symptoms and cognitive dyscontrol. Questions ask how much participants agree with items such as: "I worry that other people will notice my anxiety" on a five-point scale ranging from very little to very much. Internal consistency

was found to be in the acceptable range (α = .84); the ASI-3 contains less error variance, more reliability and internal consistency than the original ASI. Six replications in clinical and cross-cultural samples have supported construct validity using factor analysis: correlations ranged from (*r* = .41 to .53) for the clinical sample and (*r* = .26 to .63) across the international samples (Taylor et al., 2007). Osman et al. (2010) examined the psychometric properties in two studies and also found anxiety-specific correlates for the ASI-3 including: obsessive compulsive symptoms, phobia symptoms and interpersonal sensitivity.

Big Five Inventory – 10 (BFI-10). The BFI-10 was developed based on the 44-item Big Five Inventory that was first published in 1991 (Rammstedt & John, 2007). This measure assesses personality in five factors: extroversion, agreeableness, conscientiousness, openness, and neuroticism. The scale specifically asks how participants describe their personality on items such as: "is reserved" or "does a thorough job" on a five-point scale ranging from disagree strongly to agree strongly. The BFI-10 correlates with the original BFI (*r* = .83). Even though the BFI-10 includes less than 25% of the original BFI items, it has predicted almost 70% of the variance. Correlations among the five facets were *r* = .89 (extroversion), *r* = .86 (neuroticism), *r* = .82 (conscientiousness), *r* = .74 (agreeableness), and *r* = .79 (openness) and the mean retest stability coefficient in a U.S. sample was *r* = .72 (Rammstedt & John, 2007). Factor analysis was used to test construct validity; sizable loadings were found on the convergent factor (mean loading = .64). Correlations between the BFI-10 and NEO-PI-R were examined to determine convergent validity and overall correlations averaged *r* = .67 (Rammstedt & John, 2007).

Social Desirability Scale (MC-SDS). This 33-item scale was developed by Crowne and Marlowe in 1960 in order to examine how truthful respondents were being on questionnaires or whether they were trying to respond in a positive light. An attempt to appear overly positive can affect the validity of self-reports. The internal consistency reliability was found to be in the acceptable range ($\alpha = .85$) on the original 33 item true false measure (Crowne & Marlowe, 1960). Tatman et al. (2009) examined the psychometrics of the MC-SDS in adult male sexual offenders. Concurrent validity was assessed using the L and K scales on the MMPI-2 and revealed significant positive correlations ($r = .54$ and $r = .40$). Discriminant validity was established using the MMPI-2 F scale ($r = -.33$) (Tatman, Swogger, Love, & Cook, 2009). Results in this clinical sample were similar to Crowne and Marlowe's psychometrics from 1960.

EEG Process

Images: IAPS and other. The National Institutes of Mental Health (NIMH) Center developed the International Affective Picture System for Emotion and Attention at the University of Florida (Lang, 2008). The IAPS was created as a standardized system of pictures for researchers studying emotion and attention. The goal of the system is to allow better control over the emotional stimuli; it also allows the comparison of different studies conducted in different laboratories (Lang, 2008). Pictures in the system range from positive and neutral to extremely negative. The pictures are rated on a valence (pleasantness) and arousal scale from 1 to 7; one being exceptionally negative and seven being the most positive. An example of a pleasant picture is a flower and a neutral picture is a basket. The negative pictures can range in arousal from pictures of pollution to a car accident victim. Only negative pictures eliciting disgust were taken from the IAPS for

the current study. Because there weren't enough disgust images, other images were found on Google Images. The study team found images from all facets of disgust, to ensure a reliable selection of images. This included a range of disgusting images: core, animal reminder, food, sex, and contamination. It was hypothesized that images of moral disgust would not extract the same response from an EEG as core disgust, and therefore the study team decided to examine disgust sensitivity with an EEG ERP measure, and look at moral disgust through self-reports

LPP. Late Positive Potential (LPP) on EEG was captured to study stimuli associated with disgust (refer to the LPP section in Chapter II).

Electroencephalographic apparatus. EEG assessment was conducted using Contact Precision Instruments' "Psylab" EEG amplifying and recording equipment. Electrodes were placed in accordance with the international Ten-Twenty System (Jasper, 1958). Specifically, electrodes (small metal disks which monitor electrical activity) were placed using electrode paste at Fz, Cz, Pz, C3, C4, O1 and O2 scalp electrode locations, though five electrodes (Fz, Cz, Pz, C3 and C4) were analyzed. Additional electrodes were placed as follows: two EOG electrodes, one on the outer canthus and one on the upper nasal (eyebrow) region of the left eye to detect eye movement artifact, as well as two electrodes attached to the earlobes as a reference. In order to complete this procedure, small areas of the scalp were cleaned, two areas on the face (below and next to the left eye), the earlobes, and the forehead with a gritty liquid cleaner. EEG electrodes were attached to these locations with a jelly-like paste. The electrodes were attached to a computer so that the study team could observe the participants' brain electricity. During EEG recoding, the participants were asked to pay attention to a series of emotionally

negative (disgust) and emotionally neutral pictures displayed on a computer screen. Participants were told to stay still and only blink/move during the blank screen on order to avoid potential artifact.

Procedure

Recruitment and screening. Participants were recruited in the local community via Craiglist.com and flyers. Potential participants called or emailed the study's Gmail/GoogleVoice line, and then were reached by a study research assistant to be screened using the demographic questions, ideology questions and psychiatric and screening forms (refer to Appendix A-C). Participants were screened based on the criteria discussed above. The study team attempted to recruit an equal number of conservatives/liberals, and also an equal number of males/females in each group. Due to the possibility of over-screening, other demographics were not matched. Because certain demographic characteristics are inherent to each ideological group (e.g., age or ethnicity), overmatching could lessen the generalizability to the population of those particular groups in the U.S.

Data collection. Once passing the screening process, the participant came into the lab on the Nova Southeastern University campus to complete the following procedures:

1. Participant completed consent form with research assistant
2. Participant was asked again about their ideological stance
3. Saliva sample A was taken (this sampling goes beyond the scope of this study but was taken for other analyses)
4. Electrode cap was placed on participant
5. Instructions for EEG task were described and administered

6. Saliva sample B was taken
7. Questionnaires were administered on a computer via Surveymonkey.com
    a. Research study member was available to answer questions/concerns related to questionnaires
8. Participant was asked if s/her had any questions about the study, was given a $50 Target giftcard and thanked for participation.

Statistical Analyses

To address the research objectives, the data analysis consisted of the following procedure: Firstly, conducting a 2x2x5 mixed analysis of variance (ANOVA) to examine whether disgust sensitivity differs based on ideology using different EEG electrodes where the within-subjects factors were picture category (neutral and disgust) and electrode location (Cz, Fz, Pz, C3 and C4), and the between-subjects factor was ideology (self-reported liberal vs. conservative). The assumptions of the ANOVA appeared tenable, including: normality, and equal variances. Figure 1 indicates the interaction between ideology and disgust sensitivity.

Secondly, multiple mediation analyses were conducted using bootstrapping methodology to test if the five pillars (harm/care, fairness/reciprocity, ingroup/loyalty, authority/respect and purity/sanctity) mediated the association between ideology and disgust sensitivity based on the LPP ERPs (Hayes, 2013; Preacher & Hayes, 2008). A multiple mediation model allows for the evaluation of an indirect relationship in which the independent variable affects the dependent variable through intervening variables (the mediator). Figure 2 indicates the mediation model comprising of the five pillars. The

bootstrapping method has become more popular for testing mediation effects due to its non-parametric method based on resampling with replacement (Shrout & Bolger, 2002). This method involves sampling repeatedly from the data (in this case, 10,000 samples). Preacher and Hayes' macro allows for multiple mediation due to its ability to generate confidence intervals for indirect and total effects of the independent variable on the dependent variable (Hayes, 2013; Preacher & Hayes, 2008). The indirect effects and pairwise contrasts were examined.

In addition, exploratory analyses using T-tests were conducted to evaluate the mean differences in self-reported disgust sensitivity (as measured on the DES, DPSS-R, and DS-R) and other measures (MFQ30, BFI-10, ASI-3 and MC-SDS), between liberals and conservatives.

The EEG data were analyzed using PSYLAB 8 software (Contact Precision Instruments; Cambridge, MA; www.psylab.com) to construct the variables necessary for statistical analyses. The statistical analyses were performed using SPSS 24. With respect to the ANOVA, all significant and main and interaction effects were followed up using Bonferroni corrected post-hoc pairwise comparisons where appropriate. The level of significance was set at .05 for all analyses.

CHAPTER IV. RESULTS

A Description of the Sample

The study team recruited 39 participants. The first 15 were recruited using flyers and an advertisement on Craigslist.com. Recruitment methods changed when the study team noticed a community sample was showing too much artifact on EEG to have valid findings. Many participants were looking away from the disgusting images subsequently affecting electrooculogram (EOG) findings and henceforth not enough blocks were useable in the analyses. The study team then recruited participants via flyers solely on the Nova Southeastern University campus. Of the total 39 participants, 25 were used in the analyses. Of the 14 participants that were not used, five were discarded due to technical errors and nine were discarded due to excessive artifact (e.g., EOG issues). Table 1 shows the demographics of the final sample. No demographic variables were significantly different between the groups.

Table 1

Demographic Characteristics (N=25)

Demographic Variable	Conservative (n = 10)	Liberal (n = 15)
Sex (female)	60%	47%
Age	33.9 (8.4)	31.4 (10.5)
Race/Ethnicity		
White/Caucasian	70%	60%
Black/African American	20%	27%
Hispanic	30%	20%
Asian	0%	7%
Other	0%	0%
Education	16.6 (1.2)	16.5 (3.2)
Religion		
Atheist/Agnostic	30%	33%
Protestant	40%	33%
Catholic	0%	13%
Jewish	0%	20%
Mormon	30%	0%

Results of the Hypothesis Testing

A 2x2x5 ANOVA was conducted to examine the relationship between picture image and location site by ideology group. The fixed factors were picture image, consisting of two levels (neutral and disgust images), and self-reported ideological group consisting of two levels (liberal or conservative). The dependent variable was disgust sensitivity as measured through the ERP site locations with five levels (Cz, Fz, Pz, C3, C4). The means and standard errors are shown in Table 2. Results of the 2x2x5 ANOVA indicated that there was a significant main effect for electrode location, as

expected: $F(4, 20) = 4.603$, $p = .008$, $\eta^2 = .479$, observed power = .880. There was also a significant main effect for picture image, as hypothesized: $F(1, 23) = 5.214$, $p = .032$, $\eta^2 = .185$, observed power = .590. There were no other significant main or interaction effects observed. In conclusion, the results showed significant main effects for picture image and no significant interactions; although, the interactions show a trend fitting with our hypothesis. The graphs in Figure 4 are visual representations of the LPP analyses. They present the grand average visual ERPs separated by electrode location (Cz, Fz, Pz, C3, C4) and picture category (neutral and negative) for ideological group (liberal and conservative). Visual ERP analyses revealed that compared to emotionally neutral picture trials, disgust picture trials resulted in a larger visual late positive potential (LPP) at Fz, Cz, PZ, C3 and C4 electrode locations. This representation depicts a trend fitting with the hypothesis: self-reported conservatives show more disgust sensitivity than self-reported liberals.

Table 2

Means and Standard Errors for Main Effects

Location	Disgust				Neutral			
	Conservative		**Liberal**		**Conservative**		**Liberal**	
	Mean	Std.Er	Mean	Std.Er	Mean	Std.Er	Mean	Std.Er
FZ	1.819	2.336	0.859	1.908	-0.612	2.496	-1.395	2.038
CZ	2.344	2.098	1.259	1.713	0.298	2.231	-1.432	1.822
PZ	1.400	2.061	0.580	1.683	-0.005	2.094	-1.809	1.710
C3	1.919	1.952	-1.397	1.594	0.926	2.063	-3.116	1.684
C4	2.890	2.041	1.567	1.666	1.157	2.066	-1.480	1.687

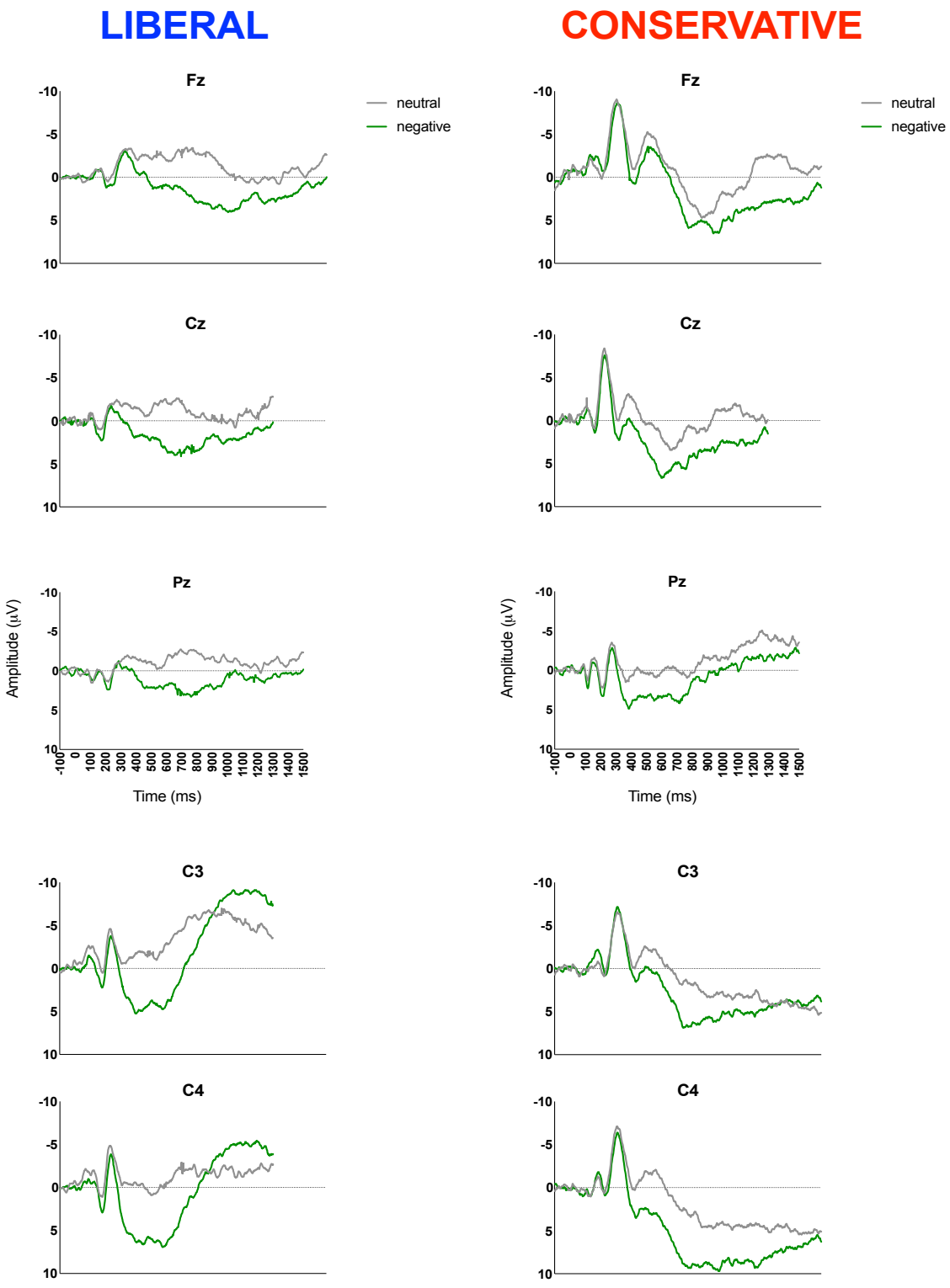
LIBERAL
CONSERVATIVE
Fz
Cz
Pz
C3
C4
neutral
negative
-10
-5
0
5
10
Amplitude (μV)
-100
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
Time (ms)

Figure 4. LPP Graphs for Self-Reported Liberals and Conservatives. Visual LPP ERPs: Participants were exposed to an emotionally disgusting or neutral picture for 300 ms. The dip on each graph depicts the analyzed latency range for the LPP. Y axis represents voltage (μV) and x axis represents time (ms).

Mediation Analyses. Regarding the secondary objective, mediation analysis using bootstrap methodology was used to examine the direct and indirect influences of ideology on disgust sensitivity through their influence on the five pillars of morality. Five mediation analyses were performed (one per each electrode location) using PROCESS 2.15 (Hayes, 2013) in SPSS 24. Type I error was set at the .05 level. The statistical model constructed to address the research questions are defined as follows:

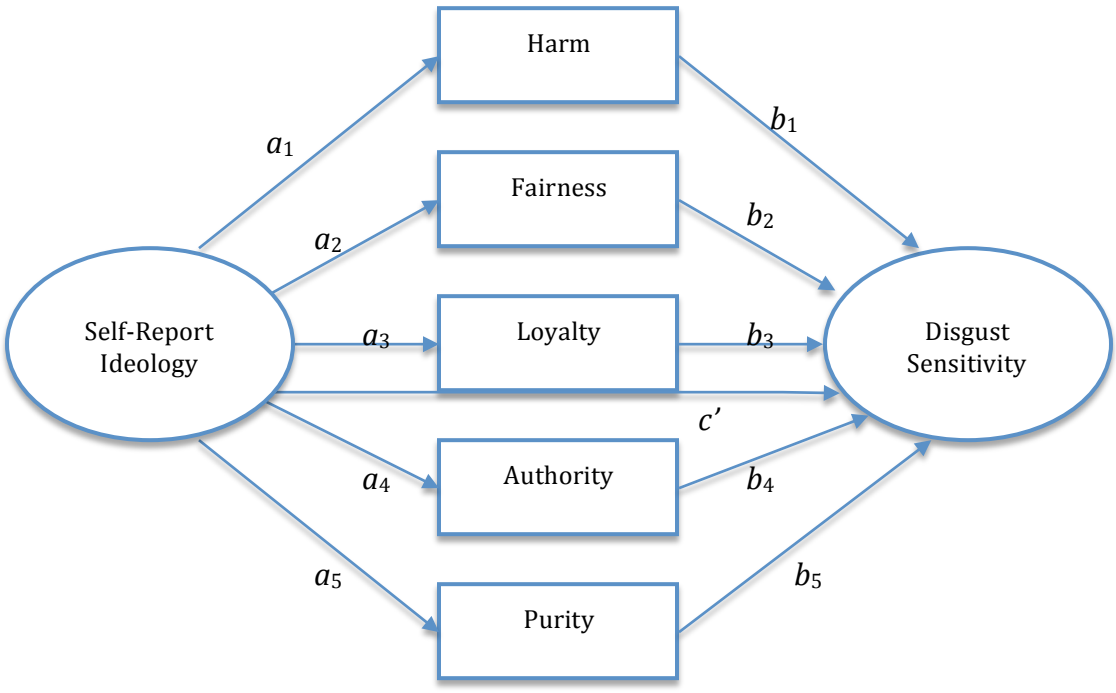

Figure 5. Path diagram for a five-mediator model. Ideology = the independent variable (X), Disgust Sensitivity = the dependent variable (Y, measured five times for each electrode location), Harm/Fairness/Loyalty/Authority/Purity = the mediating variables. The mediation model consists of two parts: the total effect of X on Y (c) which constitutes the indirect effect of X on Y, quantified by a_1b_1, a_2b_2, a_3b_3, a_4b_4, and a_5b_5 (the products of a's and b's), and the direct effect of X on Y with the effect of the mediator removed, quantified by c′, such that c = $a_1b_1 + a_2b_2 + a_3b_3 + a_4b_4 + a_5b_5$ + c′.

There were no significant mediations for self-reported ideology on disgust sensitivity for the five moral pillars, as shown in Table 3 in the appendix.

The exploratory T-tests revealed no significant differences in means between self-reported ideology and the measures administered. Results are illustrated in Table 4.

Table 4

Mean Differences Between Liberals and Conservatives

Variable	**Conservative**		**Liberal**		Sig.
	Mean	SD	Mean	SD	
MFQ30					
Harm	20.500	5.297	22.200	2.274	.279
Fairness	19.300	5.755	21.467	4.389	.297
Loyalty	16.000	3.266	15.267	5.244	.698
Authority	19.200	4.467	16.400	4.067	.118
Purity	16.500	7.153	13.733	4.340	.335
BFI					
Extraversion	6.500	1.958	6.000	2.000	.543
Agreeableness	7.200	2.251	6.930	1.668	.736
Openness	8.100	1.595	8.200	1.699	.884
Conscientious	9.000	1.333	8.000	1.813	.149
Neuroticism	6.400	2.119	5.200	2.210	.190

DES					
Animal	9.500	1.841	10.667	4.731	.467
Blood	10.200	3.225	10.929	4.000	.639
Death	18.778	6.515	17.800	5.570	.700
Smells	16.900	3.755	17.133	3.852	.882
Food	11.889	3.140	15.200	4.539	.068
DPSS					
Propensity	15.900	2.685	15.867	4.103	.982
Sensitivity	10.700	2.830	10.571	3.777	.929
DS-R					
Final	48.330	12.865	48.360	19.528	.997
SDS					
Final	6.700	1.703	6.467	1.302	.701
ASI-3					
Physical	7.200	2.616	8.000	3.094	.508
Cognitive	8.889	3.551	8.143	3.461	.623
Social	15.700	3.831	14.520	4.383	.260

Note. Measures include: Moral Foundations Questionnaire – 30 (MFQ30) containing five pillars, Big Five Inventory – 10 (BFI-10) containing five factors, Disgust Emotion Scale (DES) containing five facets of disgust, Disgust Propensity and Sensitivity Scale (DPSS-R), assessing disgust propensity and disgust sensitivity, Disgust Scale-Revised (DS-R), Social Desirability Scale (MC-SDS), and Anxiety Sensitivity Index – 3 (ASI-3) assessing anxiety via physical, cognitive and social means.

CHAPTER V.

Discussions

A limited amount of research has addressed the relationship between ideology and disgust sensitivity, and most of this research has not examined the relationship using psychophysiological measures. The incorporation of neuroscience in social psychology is a rising research interest. Therefore, this study investigated whether the ERP response was influenced by disgust sensitivity and how this response could be moderated by ideological factors. In addition, it examined possible mediators of this relationship. These results pose interesting questions regarding moral decision-making. Do people formulate their political identity based on a higher ordered cognitive process, or do they go with their "gut" reaction?

It was hypothesized that disgust sensitivity differs based on self-reported political ideology, as measured through different EEG electrode locations. It was also hypothesized that Haidt's five pillars of morality could mediate the relationship between ideology and disgust sensitivity; specifically, that purity could be a mediator for conservatives and fairness and harm for liberals. The results indicated a significant main effect for electrode location and for picture image. There was no significant moderation, though there was a trend in the direction fitting with the hypothesis that conservatives have more disgust sensitivity than liberals. Additionally, no mediators were found between ideological group and disgust sensitivity. And, it is notable that there were also no significant differences between the groups on self-report measures, including the moral foundations questionnaire and the three measures of disgust. Taken together, these results indicated that there were no statistically significant differences between the

groups: conservatives and liberals had a similar disgust sensitivity response. There were no mediators regarding this response, and they reported similarly via self-report. The results of this study found a manipulation for picture image and a trend fitting with the study hypothesis of moderation. Possible explanations are provided as to why this trend was not statistically significant, why there were no mediators and why, ultimately, there were no differences between the groups. This discussion includes an explanation of the following questions: (1) Was the LPP ERP component an appropriate measure, (2) Are there core differences between ideological groups, and (3) Could inducing disgust influence the results?

Was the LPP ERP Component an Appropriate Measure?

Given the significant main effect for picture image in the ANOVA results, the LPP ERP component was proven to be a valid measure to examine disgust sensitivity. The hypothesis that this particular brain measure would be useful in capturing the emotional response of disgust was therefore confirmed. This result was not surprising, as the LPP has been used consistently as a technique to examine implicit attitudes and emotions (Ito & Cacioppo, 2007). Subsequently, the disgust images, some of which were taken from the IAPs database and others from Google Images, were validated through this finding. This result also corroborates the conclusion that disgust is implicated in the amygdala region (Chapman & Anderson, 2012), as the LPP has been shown to represent the processes resulting from increased amygdala activation (Hajcak et al., 2010). It was further verified that the LPP could represent an alert system (deriving from fear or disgust) (Hajcak et al., 2010) and these particular images were able to successfully trigger

this neuronal process. Accordingly, the study's methodology of measuring LPP while participants viewed disgust images was deemed sound to explore the disgust emotion.

With regard to the moderation, as hypothesized, there was a trend that self-reported conservatives elicited more disgust sensitivity on ERP when compared to self-reported liberals. Inbar et al. (2008) found via questionnaires that conservatives reported more disgust sensitivity than liberals. Given that conservatives' moral foundations are constructed more from the pillar of purity (Haidt & Graham, 2007), which is linked to disgust, it is fitting that on an implicit psychophysiological measure, conservatives would display more disgust sensitivity.

While the LPP was able to distinguish between the emotionally negative responses of participants, the measure was unable to capture a statistically significant difference between the ideological groups. Is this because there were no core differences in disgust sensitivity between the groups or because the LPP was unable to parse out this disparity? The literature has demonstrated that the brain measures ERP and fMRI are able to distinguish between groups when there are differences. To illustrate this point, one needs to assess the literature on fMRI. Schreiber et al. (2013) looked at a task related to risk responses while running a BOLD-fMRI sequence. They found that during this risk-related task Democrats had higher activation in their posterior insula region while Republicans had higher activation in their right amygdala. While they were able to find the above difference between groups, they explained how they were unable to find behavioral differences between the groups, suggesting the only differences were in the underlying mechanisms. Kanai et al. (2011) also found that their liberal group was associated with increased gray matter volume in the anterior cingulate cortex, while their

conservative group was associated with increased volume of the amygdala. Ahn et al.'s (2014) study used nonpolitical images related to disgust sensitivity and physical threat to predict political orientation. They applied a machine learning approach while participants were run in fMRI; they were able to look at time-series data to examine reactions to specific stimuli and successfully investigate whether this response could differentiate between groups (in this case ideological). In conclusion, these studies were able to differentiate between ideological groups through fMRI. Some studies even affirmed the relevance of using the LPP, because many implicated the amygdala as a region of interest and some examined questions related to timing which the LPP could better measure (Hajcak et al., 2010). Accordingly, it would seem that the brain measure fMRI should be sensitive-enough to detect response differences between liberals and conservatives and that therefore ERP should be sensitive as well.

While ERP does not allow for source localization where fMRI can, it has been able to investigate emotional responses successfully taking temporal resolution into account; it has also been able to differentiate between various groups, including ideological. With regard to ERP measures, Amodio et al. (2007) administered a task where participants are presented with conflicting and complex information; this task is associated with activity in the anterior cingulate cortex. They used ERP components associated with neurocognition: the response-locked error-related negativity (ERN) and the N2 component. They found a difference between ideologies, specifically that stronger liberalism was associated with more accuracy deciphering the complex information during the trials. The N2 amplitudes did not correlate with participant behavior, showing that they only found neuronal and not superficial differences. Disparately, in order to

examine ideological differences, another sample consisted of moderates and extremists; they found larger LPP amplitudes for anarchists compared to moderates. LPP could distinguish between groups while successfully representing the response to emotional stimuli (Dhont, 2012). Gui et al. (2016) validated using the LPP measure as well. This group found that the N1 component was not influenced by emotional arousal while the N2 and LPP components were strongly affected. The LPP component was influenced by both emotional and moral stimuli. Taken together, it is apparent that the LPP was a good measure to examine disgust sensitivity, an adequate measure to examine ideological differences and a possible measure to examine morality. Therefore it is important to consider other reasons when exploring why there was no moderation between ideology and disgust sensitivity.

Are There Core Differences Between Ideological Groups?

A theoretical aspect to consider is the evolutionary nature of disgust and its current purpose. From an evolutionary standpoint the main purpose of disgust is to help the human species avoid dangerous substances and therefore act as preserver. Yet the toxicity or threats of specific substances and behaviors have changed over time as science has progressed and cultures have changed. Perhaps at present what is harmful is similar for all ideological groups, or at least similar among the cultures of liberals and conservatives in the United States. As disgust is greatly influenced by culture, perhaps the differences between these groups are too similar to capture at the present time.

Thus, perhaps this study did not find statistically significant differences between self-identified ideologies because they do not exist. Then how can one explain the research cited above that shows differences between the groups in many other aspects?

Morris Fiorina helps answer this question. He explains how researchers, the media, and the public look for differences between self-identified ideology when there are fewer underlying factors than presumed (Fiorina et al., 2010). Aligned with this theory, some researchers have argued that scholars, the media and the general public exaggerate differences in political ideology (Graham, Nosek, & Haidt, 2012). While Abramowitz (2013) contends that evidence shows this polarization has increased over the past four decades, others question if this difference is more representative of voting patterns than of core factors. Additionally, due to the file-drawer phenomenon (studies without significant results do not often get published) and people's determination to interpret and see differences, research is skewed toward a more dramatic finding (Ioannidis, 2005). There are a growing number of articles and websites constructed to show that social psychology is led by liberal-minded individuals, many whom have biases against research that portrays conservatives positively (Inbar & Lammers, 2015). Accordingly, these scholars raise a valid concern that the literature showing differences between ideological groups may be flawed, emphasizing more difference than actually exists.

Another body of research also suggests that there may not be nearly as much ideological differences between people as they are led to believe. Westfall's (2015) research shows that there is a disparity between actual polarization and perceived polarization. His research shows how there has been an increase in actual and perceived polarization from 1968 to 2008, but that the difference between the two has remained the same and not increased over time as Abramowitz postulates.

Similarly, our findings reveal that differences may be superficial: that there are fewer core differences between ideological groups than most perceive. With that, why

would Americans overestimate political polarization? One argument is the "polarization projection," an assumption that people view others to be polarized as much as they are polarized themselves, even if coming from a different extreme (Van Boven, 2012). Further, people who perceive more polarization (those of a "political class") are more politically involved (Fiorina et al., 2010; Westfall J., 2015). So, citizens may be hearing from a select group of people – extremes on either end – that do not reflect larger society.

Along these lines, John Haidt's more recent line of research focuses on these biases among social scientists (Duarte, 2015). The "Heterodox Academy" argues that the enmeshment of liberal values and lack of political diversity among the social science community puts the validity of this science at risk (Duarte, 2015). This idea is especially pertinent to the present research question, which focused on a disparity between liberals and conservatives. This study was meant to replicate and validate with a brain measure the finding that conservatives showed more disgust sensitivity than liberals. The question in itself explores a liberal narrative that perhaps places their group values above, or at least different than, conservatives. It is possible that the science which informed the current research questions was based in a similar liberal political bias. The results of this study, which show no statistically significant core differences between ideological groups, may help confirm that the political psychology literature focusing on ideological differences has replication failures. Further, recruitment for this study was on a college campus, which lacks the political diversity of other communities.

In summary, one substantial current line of literature supports this study's findings: that people are led to believe that conservatives and liberals are very different, when there

may not be a statistically significant difference between these groups regarding the question at hand, at least not at the core level.

Could Inducing Disgust Influence Results?

Another reasonable explanation for this study's results is that disgust images possibly primed and therefore manipulated participants' answers on questionnaires. An unexpected finding was that for some participants, their self-reported ideology moved towards a more centralized position (some people reported identifying as liberal before EEG and then answered as moderate on the computerized questionnaires) *after* they were hooked up to the EEG while viewing the disgusting images. This unexpected finding supports the hypothesis that disgust can influence political judgments. Research has explored whether disgust influences the severity of moral judgment and henceforth ideology (Bieke & Olatunji, 2011). Some studies actually found that inducing disgust does influence self-perceived ideology: exposure to disgusting smells changed political affiliations on questionnaires (Adams, Stewart, & Blanchar, 2014). These results have implications for how images/words of disgust can impact ideology and possibly voting patterns. Visual media is currently extremely accessible (through social media outlets, e.g., Facebook, Snapchat, Instagram or Twitter). If disgusting visual imagery influences biases, then it is likely that media can be used to manipulate political viewpoints, including voting preferences.

Though this explanation sheds light on why questionnaires showed no differences between groups, it does not explain why our ERP results, signifying a more automatic process, were not significant and only trended with this study's hypothesis.

Another explanation of our findings is that there may be differences between the groups that were not captured by the small sample size or that the sample had a selection bias. This explanation speaks to the limitations of this study and suggestions for future studies in this area of research.

Limitations

The biggest limitation is that the sample size and selection were less than ideal: the sample was small, there were differences between the diversity of each group, and 14 participants were excluded due to technical issues and artifact. The first limitation is regarding the sample size. The study team sought to recruit 40 people (20 participants from each group) to increase statistical power, but due to other limitations, was only able to analyze 25 participants. While a smaller sample size could capture salient differences on EEG, it was too small a sample to find mean differences between ideological groups. While this study used Preacher and Hayes (Preacher & Hayes, 2008) bootstrapping methodology in order to investigate potential mediators, the power was still too small to find significant differences, if there were any.

The second limitation is regarding the demographic diversity of the sample. While intending to recruit 20 participants from extreme liberal and conservative ideologies, the study team had difficulties recruiting people of conservative ideology on a liberal college campus. This factor further speaks to the lack of demographic diversity in universities at present (Duarte, 2015). Therefore, the sample included 15 liberals and 10 conservatives.

Further, the education level of the sample is higher than census data. While 33% of the U.S. population have an advanced degree (Ryan & Bauman, 2016), the average participant of the current study had a college degree or higher level of education. This

education difference could lead to more interpretation of study questions or second order thinking. There is also a question of whether more education could affect the LPP results. Is LPP actually automatic or could it be influenced by cognition and therefore be affected by a more educated sample? Neurofeedback studies have found potential to train participants of slow cortical potentials in order to alter brain functioning. Studies such as this show how the ERP is not entirely an automatic process and it is possible to self-manipulate findings (Gevensleben et al., 2014; Graczyk et al., 2014; Konicar et al., 2015). In addition, studies have found that it could be possible to use a cognitive strategy to alter an emotional response (Gruzelier, 2014; Langeslag & van Strien, 2013). Neurofeedback research utilizing ERP has mainly been implemented for the purpose of treating pathological disorders. Usually some training is involved in order to alter the EEG results and therefore these conclusions would not be fully applicable to the current study. In addition, the mean level of education in the current study was the same for both ideological groups, and therefore any possible influences would be distributed across both groups

Further, there were religious differences between the liberal and conservative groups (more participants reported being Jewish and Catholic in the liberal group, and more Mormon in the conservative group). Religious differences are inherent to the different political parties and religious diversity; for example, while 70% of U.S. citizens of Mormon faith identify as Republican, 92% of citizens belonging to African American protestant denominations identify as Democrat (Lipka, 2016). Therefore religion was not controlled during the recruitment stage of the, study, though statistically controlling for

this factor would eliminate questions of other between-subject factors. Unfortunately, there was not a large enough *n* to look at the moderating effects of religion.

The third limitation is regarding technical issues. Data from fourteen participants was not analyzed as part of the moderation and mediation analyses. Of the 14, five were excluded due to a malfunction of the equipment and nine were due to technical issues, mainly involving participant movement and EOG issues. There was a learning curve, as the research team honed their ability to direct attention toward the images, while helping the participant maintain a relaxed posture. The researchers at first had difficulty directing visual attention to the negative images. Looking away from the images could be related to inattention to disgusting pictures and therefore be a selection bias. Consequently, these participants could be the ones most affected by the images and could have influenced the findings (Zimmer, Keppel, Poglitsch, & Ischebeck, 2015). ERP studies have found that attention to sound and images is first attracted toward disgust and then is quickly directed away (Bertels, 2013; Cisler, 2010). Perhaps once visually directed away, participants did not return attention back to the computer screen and missed viewing too many images to be used in the study.

Implications for Future Research

Future investigations focused on ideological differences and disgust should pay attention to various issues that arose in this study. Due to the possibility that disgust images manipulated the findings, future studies should consider priming effects. It could be beneficial to administer questionnaires before running the EEG to eliminate disgust priming. Or, it may be worthwhile to give questionnaires of similar construct validity before and after the EEG and analyze the differences. Three disgust measures were

administered, and instead of administering them all at the end of the study, they could have been spaced throughout.

Specifically with regard to the relationship between EEG and disgust, it is important to control for technical artifact that could result in movement or EOG issues. Inattention is a serious concern because studies of disgust require subjects to respond to a specific number of images, providing researchers with enough valid data to be analyzed. To become more aware of whether participants are paying visual attention to negative images and discover methods to assist participants in attending, technicians could pilot the study first in order to practice their technical skills on a community sample while showing the disgust images.

Though difficult to fulfill, future studies should pay specific attention in the recruitment stage to show how the sample generalizes to the population they want to study and if participants are excluded in a way that could impact the results. With regard to this sample, the study team attempted to recruit a polarized sample that reflects the general population. It could be beneficial to recruit among the "political class" rather than the general population to assure a true political difference. This study focused specifically on a polarized sample, while future studies could also consider recruiting a larger sample and examining the groups continuously rather than dichotomously. More variance will add statistical power.

Future studies could also focus on one of the other five pillars. Since the development of this study there have been heated campaigns in both parties, and the general election campaign promises to be just as emotional. The interests and candidates of the 2016 election are different from those in past elections. While the last two elections

focused on social political issues related to purity such as same-sex marriage and stem cell research, terrorism and fear have dominated this political season. For this reason, focusing on the ingroup/outgroup pillar, which relates to the feelings of protecting one's own culture, could be especially pertinent. Feelings related to immigrants and Muslims are especially ripe for exploration given the ways these groups have been discussed in the media. LPPs have been found to be a sensitive measure in studying both disgust and fear by Wheaton et al. (2013), and therefore could be an effective method to examine the pillar of ingroup/outgroup.

Further, perhaps looking at ideology dichotomously (liberal/conservative) is an outdated distinction. Haidt suggests that Americans are more divided by their views on nationalism as opposed to globalization (Haidt, 2016). This is a shift from the past values that separate more between the liberal and conservative ideological groups.

The results of this study imply that studying disgust sensitivity alone might not help resolve differences between ideological groups. Studies have begun to focus on morality and moral disgust as opposed to disgust sensitivity. Moral disgust has also been shown to be an automatic process in recent literature and able to be examined through ERP. Research examining differences between disgust and moral disgust could capture more information. Recent studies have shown different neural processing in participants while they judge morally wrong situations compared to physically disgusting situations (Luo et al., 2013; Yang et al., 2014; Zhang, 2015). Though studies have examined moral disgust compared to core disgust, none have deciphered if there are differences between populations, including ideological groups. With a task linked more to morality, a difference could become more salient.

Finally, future studies could also focus more on similarities between ideological groups and bridging the gap between the many differences in the United States. This is an important research area to consider with rewarding benefits. Research that illuminates what citizens have in common across ideological and political differences can respond to the dominant narrative that the United States is a polarized, divided nation. Studies that help the country understand where they are united as a people can help people find common ground – common ground that can be used to promote progress in a great nation.

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