Psychophysiology in Political Decision Making Research

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Summary and Keywords

Since the early 2010s, political science has seen a rise in the use of physiological measures in order to inform theories about decision-making in politics. A commonly used physiological measure is skin conductance (electrodermal activity). Skin conductance measures the changes in levels of sweat in the eccrine glands, usually on the fingertips, in order to help inform how the body responds to stimuli. These changes result from the sympathetic nervous system (popularly known as the fight or flight system) responding to external stimuli. Due to the nature of physiological responses, skin conductance is especially useful when researchers hope to have good temporal resolution and make causal claims about a type of stimulus eliciting physiological arousal in individuals. Researchers interested in areas that involve emotion or general affect (e.g., campaign messages, political communication and advertising, information processing, and general political psychology) may be especially interested in integrating skin conductance into their methodological toolbox. Skin conductance is a particularly useful tool since its implicit and unconscious nature means that it avoids some of the pitfalls that can accompany self-report measures (e.g., social desirability bias and inability to accurately remember and report emotions). Future decision-making research will benefit from pairing traditional self-report measures with physiological measures such as skin conductance.

Keywords: skin conductance, decision-making psychophysiology, electrodermal activity, physiological measurement, biopolitics, political psychology, political behavior, political decision making

Introduction

Research on political decision-making has traditionally been dominated by self-report surveys. However, the 2010s has seen a steady increase in the publication of studies utilizing psychophysiological techniques as alternatives to self-reported survey questions. This research has appeared in top journals, both in political science and in general science journals, and these articles have been widely cited. As these studies demonstrate, physiological measures have several advantages that make them a useful complement to traditional approaches. This approach is clearly more than a passing fad. The use of physiological

measures has the potential to enrich researchers' theorizing and improve empirical insights into how citizens confront political choices. At the same time, if political physiology research is to maximize its potential, researchers must proceed with a clear view of both the advantages and disadvantages of the approach.

This article attempts to provide a holistic view of physiological research and the role it can play in research on political decision-making going forward. The aim is to provide something of value to scholars who are unfamiliar with this research as well as to those working in this area. To that end, it outlines where political physiology research has been, where it is (or in the authors' view where it should be) going next, and the challenges researchers will need to confront if it is to achieve its potential. The article's focus is on research that directly examines political questions, but it discusses some psychological research that bears directly on the article's arguments. Finally, while it primarily discusses electrodermal activity (EDA, or skin conductance) because that has been the primary physiological technique brought to bear on politics, the article also makes mention of other physiological techniques where appropriate.

The Self-Report Paradigm and the Limitations of Self-Reports

For as long as social scientists have sought to understand the behavior of ordinary people, self-reports have been relied on. The simplest and most straightforward way to understand why humans think what they think and do what they do is to ask them. Research on the political behavior of the mass public has been no exception. While political elites inevitably provide a trail of roll-call votes, transcripts of speeches or legislative activity, campaign advertisements, and funding disclosures for scholars to pore over, the average citizen can proceed through her political life leaving virtually no trace of involvement in politics. If researchers want to know more than the bare bones of voter registration, turnout behavior, or campaign donations, they need insights into the motivations, goals, and thought processes of ordinary people, which can (seemingly) only be provided by self-reports.

The central role of survey self-reports in shaping knowledge of American political behavior can be seen by tracing basically any topic back to the foundational texts: From partisanship and political sophistication (Campbell, Converse, Miller, & Stokes, 1960; Converse, 1964) to voting and political involvement (Lazarsfeld, Berelson, & Gaudet 1948; Verba & Nie, 1972), what is known is known because of survey self-reports. Even as the discipline has shifted away from its traditional emphasis on the purported external validity of observational survey research toward a paradigm emphasizing experiments and internal validity, self-reports maintain their central place in current work, frequently serving as the dependent variables of interest.

Self-reports are ubiquitous, but that does not mean that their use has gone without scrutiny. From the earliest days of survey research, scholars have pushed up against the inherent limitations of people stating what they think, feel, and do. Over the years, at least three broad issues have been raised to challenge the validity of self-reports. First, early questions regarding the validity of self-reports centered on issues of social desirability (e.g., LaPiere, 1934). Survey respondents may dissemble for a variety of reasons which can make the researcher's job difficult. On sensitive topics, such as race or sex, respondents may wish to withhold their true opinions in order to avoid social sanction or even the perception that their views are being judged in a negative light (see Krumpal, 2013 for one review of this literature.) Even seemingly benign factual claims can be distorted by social desirability. For example, rates of self-reported voter turnout always exceed actual turnout rates, suggesting a reluctance by some respondents to admit that they stayed home on election day (Holbrook & Krosnick, 2010). That such an effect can be observed, even for a topic where the social stigma (against abstention) is extremely weak, highlights the ubiquity of distortion rooted in social desirability.

A second broad challenge in the use of survey self-reports came about as a result of scholars carefully scrutinizing the underlying meaning of the answers respondents provided to survey questions. With the documentation of a host of survey response biases brought on by minor changes to question wording, order, and format (e.g., Schuman & Presser, 1981), it became increasingly clear that respondents did not have carefully considered views on many of the topics on which they were queried. This made it untenable to view survey responses as directly mapping onto how respondents thought about the topic at hand because fixed survey responses implied far greater certainty than most respondents possessed. Researchers may know what they are asking, but they cannot readily assume that respondents are understanding their questions in exactly the way they intend. This insight led to the development of theories of survey response that more realistically approximated human psychology, incorporating uncertainty and ambivalence into the process of respondents answering survey questions off the top of their heads (e.g., Tourangeau, Rips, & Rasinski, 2000; Zaller, 1992).

A third challenge to the validity of survey responses comes from the possibility that respondents are being influenced by forces outside of their conscious awareness. An understanding of decision-making based entirely on self-reports requires that all of the factors influencing the decision are known to the respondent at the time the choice is being made. If people are influenced by unconscious affective responses, self-reports will be incomplete accounts, at best. At worst, they could be highly misleading rationalizations. The basic insight that emotions could be influencing decision-making outside of conscious awareness underlies a host of different theories and approaches meant to capture this process, including dual processing models of reasoning (e.g., Petty & Cacioppo, 1986), primacy of affect theories (e.g., Damasio, 1994), and implicit attitude approaches (e.g., Greenwald, McGhee, & Schwartz, 1998), as well as political science variants such as Affective Intelligence Theory (Marcus, Neuman, & MacKuen, 2000), and John Q. Public (Lodge & Taber, 2013). The specifics of these theories and approaches vary, but they share a view that self-reports must be (at the very least) supplemented with alternative

methodologies that capture affective reactions outside of the conscious awareness of the respondent.

Taken together, these challenges to the validity of self-reports paint a somewhat dire picture. Survey respondents appear largely unaware of the role emotions play in influencing their decisions. Their already incomplete view is further distorted by the nature of the survey response where attitudes are constructed off the top of their heads. And then, even if they manage to come up with a response that has some measure of fidelity to their underlying thought process, there is a nontrivial chance that they will dissemble. Viewed from this pessimistic perspective, it is a miracle that anything has been learned from self-reports at all. Of course, the pessimistic view pushes its case too far. With careful survey design and careful interpretation, there is much that can be learned from self-reports. Indeed, as discussed here, even alternative measurement approaches tend to rely on survey self-reports at some level. What is crucial to note is that there is ample reason to seek complementary approaches. Physiological measures are appealing for all of the ways they can enhance an understanding rooted in the self-report paradigm.

Skin Conductance and Physiological Arousal

There are a variety of physiological measures available to tap into responses of the sympathetic nervous system (SNS). The SNS mobilizes the body in response to external stimuli—it is, in essence, the fight or flight system. These measures include heart rate, respiration, the contraction of facial muscles, as well as skin conductance, the focus of this article.[1] Each measure has different properties, but all of them derive their value for present purposes from their ability to tap into SNS arousal. The reason this article focuses on skin conductance is because the vast majority of applied research on decision-making (political and otherwise) has made use of skin conductance as a primary measure. Skin conductance measures work by sending a small current of electricity through two electrodes (usually placed on the fingertips) and measuring changes in that current resulting from different levels of sweat in the eccrine glands on the skin. Conductivity can vary because of both external and internal factors. Sitting in a warm room will lead a person to sweat and their skin conductance will be elevated as a result. More importantly for present purposes, a person who is psychologically aroused in some way will also sweat more and thus display higher levels of skin conductance. If extraneous factors (like room temperature) are held constant, changes in skin conductance can be measured in response to research stimuli and conclusions can be drawn regarding the causes and consequences of SNS arousal. Importantly, arousal occurs in response to both negative and positive affect. Seeing images of loved ones will elicit positive affect and increase physiological arousal, as will negative stimuli, such as disgusting images or reminders of death and mortality. The measure itself does not distinguish between the valence of the stimuli, so researchers must take care in interpreting results.

Skin conductance has become the preferred measure for applied researchers for a variety of theoretical, methodological, and practical reasons. First, skin conductance measures

have been well validated as a direct measure of SNS arousal (Dawson, Schell, & Filion, 2007). In other words, changes in skin conductance are substantively meaningful provided that the researcher has been careful to account for environmental confounds (e.g., room temperature). Second, skin conductance measures are relatively easy to implement and noninvasive. It is not hard for a researcher (or research assistant) to learn how to place the electrodes, and the fingertip placement means the research participant can be comfortable. Other physiological measures are more challenging. For example, heart rate and respiration measures typically require placing equipment around the torso, often under the participant's shirt, which can create both physical discomfort and stress. Third, skin conductance measures have relatively strong temporal resolution; that is, changes in skin conductance in response to stimuli manifest in a matter of seconds. Other physiological measures are slower to change in response to stimuli, which can make substantive interpretation difficult.

Finally, skin conductance measures are resistant to distortion from conscious control. In other words, it is relatively difficult for a participant to decide that she or he wants to elevate their skin conductance in response to one stimulus and lower it in response to another. People simply do not have the kind of fine-grained control necessary to manipulate electrodermal activity (EDA) responses. To understand the research value of that feature, contrast EDA with respiration or facial muscle response. While a person's respiration may unconsciously change in response to affective arousal (e.g., quickening when watching a scary movie), he or she can also consciously override this response and exert direct control over breathing patterns ("Okay, deep breaths"). Similarly, facial muscle readings can detect unconscious emotional reactions, such as visually imperceptible smiles or frowns, but those unconscious reactions can be overridden with relative ease. Anyone who has ever pretended to smile at a bad joke has experience with this very activity. Skin conductance measures are not completely immune to these conscious distortions, but they are highly resistant, especially in research settings where participants are instructed to sit still and watch stimuli with no prior knowledge about what to expect and no motivation to obscure their reactions.

Taken together, these attributes make EDA measures quite appealing as a complement to self-reports. Because skin conductance provides a functional real-time reading of SNS arousal, researchers are able to monitor affective response to specific stimuli occurring outside of conscious awareness. Thus, EDA measures address all three concerns with self-reports that were outlined in the section "SELF-REPORT PARADIGM AND THE LIMITATIONS OF SELF-REPORTS." The measure is directly tapping into affective response, with no conscious component. Concerns about social desirability require conscious dissembling on the part of the participant. Similarly, concerns about the meaning of the survey response are circumvented because there is no conscious survey response to interpret. The substantive meaning of elevated skin conductance levels is well understood, with the caveat that the measure cannot directly inform the valence of the arousal.

Given these various advantages, it is tempting to imagine skin conductance measures as a superior alternative to survey self-reports. In this line of thinking, the physiological measure is closer to the "true response" because it is not contaminated by dissembling or confusion about the meaning of the question. However, it is important to resist this conceptualization. As with other implicit measures, such as the Implicit Association Test (see Perez, 2016) and the Affect Misattribution Procedure (Ditonto, Lau, & Sears, 2013), the best evidence available suggests that physiological reactions and self-reports both say something meaningful about political behavior. Smith, Oxley, Hibbing, Alford, and Hibbing(2011B) provide a useful illustration of this in their examination of disgust sensitivity and attitudes. In the study, Smith and company measured participants' physiological reaction (via skin conductance) to disgusting images. They found that individuals who show elevated SNS arousal when viewing disgusting images reported greater opposition to gay marriage and identified as more conservative than participants who were not as affected by the disgusting stimuli. Note that even in this physiological portion of the study, self-reports play a crucial role as the dependent variables of interest. But beyond that, Smith et al.'s (2011B) findings reinforce the complementary nature of implicit and explicit measures. In addition to their physiological measure of disgust reaction, Smith et al. (2011B) administered a self-reported disgust sensitivity scale that has been widely used and validated in psychological research (Haidt & Hersh, 2001; Inbar, Pizarro, & Bloom, 2009). Despite physiological disgust reaction and self-reported disgust sensitivity demonstrating no correlation with each other, both are significantly related to political attitudes when included in the same model. It seems clear that self-reports and skin conductance measures are tapping into different processes and thus should not be seen as substitutes for one another.[2]

Physiology and Nonpolitical Decision-Making

Studies in psychology have frequently used skin conductance to investigate how people make decisions, especially risky choices. In these studies, skin conductance provides a measure of affective arousal that can be tracked before and after a risky decision is made. This gives researchers purchase on how emotion plays into anticipatory behavior as well as on reactions to different kinds of outcomes. The key comparison is skin conductance levels between participants at different stages of the game (before or after a risky choice) or in different experimental conditions. One particularly popular research design has been to measure skin conductance while research participants play the Iowa Gambling Task (IGT) (or minor variants of that task). The IGT was developed by Damasio and his colleagues (Bechara, Damasio, Damasio, & Anderson, 1994) as a means of studying risky choice decision-making in a laboratory setting. The task involves the participant beginning with an endowment of (either real or play) money and then drawing from four decks of cards that add to or subtract from the initial endowment. The decks differ both in their overall profitability and in the magnitude and frequency of risk (e.g., one deck leads to more frequent, smaller penalties while another deck has rare but significant losses associated with it).[3] The finer details of the task are not relevant for present purposes.

The important point is that the IGT provides a useful means for researchers to study how affect informs decision-making.

Crone and van der Molen (2004) provides a nice illustration of the framework for studying physiological response and decision-making in the IGT. Crone and van der Molen (2004) had participants play a version of the IGT while their heart rate and skin conductance were being measured. They found elevated skin conductance and slower heart rate preceding the choice of disadvantageous decks relative to decks that were advantageous in their payouts for participants who performed well in the game, but no such physiological differences were observed for poor performers. The authors interpreted this pattern of results as good performers possessing stronger somatic affective signals guiding them away from undesirable decks and toward the higher payout options. In contrast, all participants (regardless of whether they were good or bad performers overall) showed the same physiological pattern of slow heart rate and heightened skin conductance after losses. Thus, losses in the game appeared to affect all participants equally while only good performers felt anxiety that helped to steer them away from poorly performing decks.

From this basic framework, scholars have studied the physiological correlates of decision-making in the IGT with a variety of different populations and under different contextual conditions. These studies have covered quite a range of possibilities. Goudriaan, Oosterlaan, de Beurs, and van den Brink (2006) found lower anticipatory skin conductance reaction among pathological gamblers than neurotypical control participants.[4]Denburg, Recknor, Bechara, and Tranel (2005) studied patterns of anticipatory skin conductance reactions in elderly participants, while Crone and van der Molen (2007) did the same with children and adolescents. Hinson, Jameson, and Whitney (2002) explored whether affective reactions would be muted under conditions of heavy cognitive load.

Beyond the IGT, skin conductance measures have been employed to study the role of affect in other decision-making tasks, including the trust game (Keri & Kiss, 2011) and the ultimatum game (van’t Wout, Kahn, Sanfey, & Aleman, 2006; Osumi & Ohira, 2010). In a particularly colorful variation, Ring (2015) measured participants’ skin conductance while he informed them about the probability that they would receive an unpleasant electric shock. Ring varied whether the information about shock probability was framed in positive or negative terms and found significantly elevated skin conductance for participants who received negatively framed information about receiving the shocks. The specifics of these tasks obviously vary considerably, but skin conductance is consistently used as a measure of affective reaction and levels of ectodermal activity (EDA) are measured under different conditions of the game (winning, losing, playing against a human vs. playing against a computer).[5]

Physiology and Political Decision-Making

Having laid out the affirmative case for incorporating skin conductance measures as indicators of affective response and reviewing studies of nonpolitical decision-making, the article now turns to a discussion of what work has been done thus far along these lines in

the political realm. The first thing to note is that, despite the fairly substantial body of physiological research described, very little physiological work in political science has focused on decision-making specifically. Instead, most existing studies have sought to understand political attitudes. Obviously, attitudes have been shown to play an important role in shaping political choices, but the relative dearth of studies on decision-making is notable, especially when viewed in the context of applied skin conductance research outside of political science.

Physiological research in political science falls broadly into two major categories: research focusing on skin conductance as an indicator of affective states, similar to the work already reviewed, and research using physiological measures to tap into underlying, trans-situational individual traits. Both of these approaches share a common understanding of skin conductance as an indicator of unconscious affective response, but the state-based approach is focused on understanding how different situations elicit different emotional responses, while the trait-based approach is preoccupied with how the same stimuli will produce different responses across different types of people.

The earliest political physiology work, by far, was conducted by Wahlke and Lodge (1972). This groundbreaking article made many of the same arguments made here about the value of physiological measures as complements to survey self-reports and anticipated much of the later focus of political physiology with its emphasis on threat response and use of images as stimuli. The basic design of the study saw Wahlke and Lodge manipulating exposure to threatening stimuli and comparing changes in both self-reported responses and physiological readings from a prerecorded baseline administered weeks earlier. Though their results were inconclusive, Wahlke and Lodge's study was massively ahead of its time and their arguments about the need for what they call a "multiple-indicator" approach to political behavior are as apt in the early 21st century as they were in 1972.[6]

To illustrate just how far ahead Wahlke and Lodge were requires jumping ahead more than 30 years to the next state-based study of physiological research: Mutz and Reeves' (2005) examination of televised incivility. The crux of Mutz and Reeves' study is a comparison between two versions of the same political debate. Professional actors performed the same script, with the crucial difference that in one version they behaved in a very civil, courteous fashion, while in the other they rolled their eyes, sighed audibly, and generally were as rude as possible. Experimental participants in the uncivil condition reported being more entertained by the debate than their counterparts who saw the polite version, but exposure to incivility also significantly reduced trust in government. Mutz and Reeves interpreted their findings as evidence that citizens experience televised political content viscerally, in much the same way that face-to-face violations of social norms would affect them. To help validate this theoretical claim, they measured differences in skin conductance between participants in the two experimental conditions. They found consistently higher levels of ectodermal activity (EDA) in participants viewing the uncivil condition. Note that their research design does not allow them to determine whether the heightened affective reaction in the uncivil condition is the result of positive affect (the uncivil debate was perceived as more entertaining) or negative (because of negative

views of the conflict contained in the uncivil debate). Because skin conductance cannot directly inform the valence of the response, one can only say for certain that the uncivil debate stimulated more affect than the civil version.

A similar study was carried out by Bradley, Angelini, and Lee (2007), who measured physiological reactions to different kinds of political advertisements. Experimental participants viewed political ads that had been determined by the researchers to be positive, negative, or "moderate." In keeping with the findings of Mutz and Reeves, Bradley and coauthors found higher levels of skin conductance for respondents viewing either positive or negative ads compared to those in the moderate condition, with particularly strong reactions in the negative condition. Self-report data also indicated that negative ads were recalled more readily than positive or moderate ads. These findings track well with established wisdom in physiological research that finds that while both positive and negative stimuli will elicit elevated EDA, negative reactions tend to be stronger (Taylor, 1991).

Stuart Soroka and his colleagues have examined physiological reactions to negativity in news content cross-nationally (Soroka, 2014; Soroka, Fournier, & Nir, 2017). They found that negative stories elicit stronger physiological responses than positive stories, with politically conservative participants reacting more to negativity than liberals or moderates. This pattern of results generally held across countries, but participants in Japan did not show a negativity bias. The comparative nature of Soroka's research highlights an important caution for scholars studying affect and physiological reactions. Skin conductance readings will only be as informative as the stimuli used to elicit the response. If negativity (or threat, or disgust) means something different across contexts or across individuals, one could draw erroneous conclusions. It is possible that Japanese people do not have a negativity bias, but an alternative explanation could be that their understanding of negativity or their threshold for negativity is different from people in other cultures.

The possibility that individuals could differ in their baseline orientations to stimuli segues nicely into the second major branch of research on political physiology—the work on trait-based differences in affective response. This research has been primarily conducted by John Hibbing, Kevin Smith, and John Alford along with a variety of collaborators over the past decade (2010s). Hibbing, Smith, and Alford argue that political differences between liberals and conservatives are largely rooted in basic biological differences in tastes and perceptions (Hibbing, Smith, & Alford, 2013). Skin conductance has been one of the primary tools they have used to demonstrate these differences. In order for skin conductance measures to serve as a useful indicator of trait-level individual differences, it is crucial that EDA readings exhibit some substantial degree of temporal stability. If highly reactive participants in trials at Time 1 were low in reactivity at Time 2 (and vice versa), there would be very little basis for believing that skin conductance measures could predict stable differences in attitudes and behavior. Fortunately, existing physiological research strongly supports the idea that individual differences in skin conductance reactions are stable over time. Schell, Dawson, Nuechterlein, Subotnik, and Ventura (2002) examined EDA responses in neurotypical and schizophrenic patients at two time points 1 year apart and found substantial degrees of stability in both populations. Crider et al.

(2004) went a step further by examining the test–retest EDA stability in a population of monozygotic and dizygotic twins. This design allowed them to examine both the temporal stability of EDA reactions as well as the relative genetic and environmental influences on EDA response. They found evidence of substantial temporal stability and substantial genetic influence. These findings provide the basis for Hibbing, Smith, and Alford's use of EDA responsiveness as trait-level predictors of political variation.

Oxley et al. (2008) provides a useful illustration of the basic research design employed by Hibbing, Smith, and Alford. Participants were brought into the lab two separate occasions. On the first visit, they obtained a variety of survey-based measures, including items to distinguish differences in political preferences. Several weeks later, participants returned to the lab and were shown a series of images while their physiological reactions were measured. Oxley et al. (2008) found that individuals who showed heightened physiological response to threatening stimuli were more likely to hold conservative views on a variety of issues that deal with social threats (e.g., terrorism or gun control, not social welfare issues).

One potential concern with this design is that it is observational and the results are purely correlational. There is no experimental manipulation to sort out the direction of causality. The authors are careful not to assert evidence of causality from their correlational evidence, but it is clear that their theoretical orientation implies a causal pathway running from physiological traits to political views, not the other way around. The Hibbing, Smith, and Alford conception of ideology holds that biological differences (including those manifesting in EDA measures) shape individual perceptions of the world, which leads people to adopt political views to address the psychological needs that stem from these different perceptual experiences (Smith et al., 2011A). This view is similar to Jost's conception of ideology as motivated social cognition (Jost, Glaser, Kruglanski, & Sulloway,2003; Jost, 2006). Oxley et al. (2008) cautiously interpret the correlation between threat sensitivity (as measured by EDA reaction to threatening images) and conservative political views as evidence that both threat response and conservative issue positions derive from a common biological source.

The ability to make causal claims from observational evidence should never be taken lightly, but there are both theoretical and methodological reasons to see political attitudes as causally downstream of physiological reactivity. On the theoretical side, rooting ideology in general psychological needs makes the reverse causality argument somewhat tortured. It is easier to see how an automatic, unconscious sensitivity to threat would lead a person to support policies that they believed would minimize the threat. The alternative causal story would be that support for gun control or foreign intervention leads individuals to have a stronger affective reaction when confronted with generic threatening images. As discussed (see "SKIN CONDUCTANCE AND PHYSIOLOGICAL AROUSAL"), the nature of EDA response makes it unlikely that conservative individuals could successfully manipulate their physical reactions in this way. Changing trait-level physiological reactions would require systematic conditioning, and given that people are typically unaware

of the nature of the unconscious reactions, this type of conditioning seems highly implausible.

Methodologically, Oxley et al. (2008) reinforce their EDA-based finding by replicating the basic pattern of results with a second physiological measure: blink amplitude. In essence, Oxley et al. (2008) measured how hard respondents blinked when participants were exposed to a blast of white noise administered through headphones. Once again, individuals with the strongest reaction to threat were more conservative on issues relating to social protection. Clearly, the relationship between physiological threat sensitivity and political views is not an artifact of one particular measurement technique.

Building off the basic design of Oxley et al. (2008), Hibbing, Smith, and Alford carried out the study of disgust reactions discussed earlier (Smith et al., 2011B). Recall that one of the key features of this article was that it demonstrated the complementary nature of skin conductance measures of disgust and self-reported disgust sensitivity. Hibbing and Smith (along with their collaborators) demonstrated this pattern in a subsequent study examining self-reported emotional response and EDA reaction to an image of President Obama, predicted approval of the president, as well as attitudes toward the Affordable Care Act (Wagner et al., 2015).

Hibbing and Smith have also pushed further in terms of utilizing multiple biologically based measures to corroborate findings from skin conductance. Dodd et al. (2012) found that liberal research participants showed heightened EDA, relative to conservatives, when viewing images with positive valence while conservatives had a more pronounced physical reaction to aversive stimuli. Eye-tracking results showed that liberals' and conservatives' patterns of attention comported with the skin conductance results. Conservatives were quicker to attend to negative images and spent longer looking at those images, while liberals showed the same pattern for positive stimuli.

Finally, though most political physiology research has been focused on explaining attitudes, there have been some studies that look at political decision-making, mainly the decision to participate in politics. As of this writing, the only skin conductance study to look at participation was Gruszczynski, Balzer, Jacobs, Smith, and Hibbing (2013). Gruszczynski and colleagues showed participants a series of images that varied in content and affective valence (i.e., some political and some nonpolitical images, some positive, some negative, and some neutral). Their key independent variable was the overall mean EDA reaction across all of the images. This measure of physiological reactivity positively correlated with a variety of participatory acts, including validated voter turnout. Outside of EDA measures, French et al. (2014) found that baseline differences in cortisol (a hormone that regulates stress) predict self-reported and validated voter turnout.[7]

Opportunities for Future Research

Skin conductance measures have added to scholars' knowledge across a range of topics, but in many ways they have only scratched the surface of what these techniques can contribute to the understanding of politics. As more scholars become familiar with physiological methods and the necessary equipment becomes more readily available, there will likely be a rapid increase in research along some of the following lines. There are obvious next steps in both the state-based and trait-based paradigms, as well as a need for work to bridge the gap between the two. First, in terms of using skin conductance to assess situational affective states, and following Mutz and Reeves (2005), scholars should consider using ectodermal activity (EDA) measures to validate the emotional resonance of experimental manipulations.

The study of emotion has become a central focus of political psychology research in recent years, either through a focus on discrete emotions (e.g., Marcus, Neuman, & MacKuen, 2000; Brader, 2006; Albertson & Gadarian, 2015) or hot cognition (Lodge & Taber, 2013). Most recent work on emotion and politics relies on experimental manipulations to induce the emotional state of interest (Albertson & Gadarian, 2016). This has many advantages over earlier approaches that simply asked respondents to self-report on their emotional states. However, one potential difficulty is that it is not always known whether the manipulation has done its job.

EDA measures allow researchers to assess how successful their experimental manipulations are at inducing an emotional response. If participants are shown a scary video clip, it can be shown which participants are reacting to the clip and which ones appear to be unaffected. This means treatments can be validated and causal effects of emotion can be isolated by examining differences across treated individuals. In future work, scholars of emotion and politics should find a use for skin conductance at the research design stage when they are developing treatments.

A second avenue of state-based physiological research would be for political behavior scholars to emulate work from psychology in studying political decision-making, reviewed in the section "PHYSIOLOGY AND NONPOLITICAL DECISION-MAKING." Clearly, EDA can provide researchers with valuable insights into the affective forces that shape the choices people make. Tasks like the trust game, the ultimatum game, and the Iowa Gambling Task may seem a little too abstract for some political scientists, but they can teach researchers a lot about the building blocks of decision-making, including trust, generosity, and cooperation. These tasks can also be modified to enhance their political relevance. For example, in a non-physiological study, Carlin and Love (2013) found that people played the trust game differently when they were given partisan information about their fellow players. It is easy to imagine that emotional responses in the game could differ when a participant is short-changed by a fellow partisan versus being taken advantage of by someone from a rival political camp.

On the trait-based side, scholars still have a lot to learn about how physiologically based dispositions should be integrated with the vast universe of individual difference measures that have been developed using self-reports. Over the years, political psychologists have made use of a host of constructs, including the Big Five (Gerber, Huber, Doherty, Dowling, & Ha, 2010; Mondak, Hibbing, Canache, Seligson, & Anderson, 2010; Gerber, Huber, Doherty, & Dowling, 2011), authoritarianism (Bouchard, 2009; Hetherington & Suhay, 2011), social dominance orientation (Pratto, Sidanius, Stallworth, & Malle, 1994; Ho et al., 2012; Van Hiel & Mervielde, 2002), need for cognition (Cacioppo, Petty, Feinstein, & Jarvis, 1996; Holbrook, 2006), and need to evaluate (Bizer et al., 2004; Federico, 2004; Jarvis & Petty, 1996), among many others. Physiological trait measures should not merely add to the cacophony, so it will be imperative that these measures are situated in the broader context of how best to conceptualize stable individual differences. Along similar lines, it will be important to ascertain the full range of traits that are amenable to study using physiological means. Thus far, trait-based work has focused on threat and disgust sensitivity as well as negativity bias and overall, trans-situational responsiveness. Are there other physiologically instantiated traits that have yet to be uncovered? And how closely related are the ones that have already been explored? These are questions that the next generation of trait-based political physiology research should strive to answer.

Finally, research on physiology and political behavior should start to move beyond the trait and state-based dichotomy by developing research designs that incorporate both simultaneously. It is known that individuals differ in their tendency to experience certain emotional states and the degree to which a given stimulus will evoke an affective response. It is also known that, all else equal, different affective states have predictable consequences for how people think and behave. The challenge is to understand how these strands fit together in the real world of political competition. Some studies have made tentative first steps in the direction of studying physiological dispositions and situational variation simultaneously. Renshon, Lee, and Tingley (2015) measured EDA response to a video designed to induce anxiety and demonstrated that physiological reaction mediated the relationship between anxiety inducing-stimulus and anti-immigrant attitudes. Their work echoes Jost (Jost et al., 2003) in an important way. Jost and his collaborators argue that stable trait-level differences in psychological needs will influence political attitudes, but crucially, that situational variation can shift everyone in a more liberal or conservative direction by making certain needs more salient. The canonical example of this is the rightward shift in attitudes that resulted from the September 11th terrorist attacks.

A second study, by Coe, Canelo, Vu, Hibbing, and Nicholson (2017), showed that the strength of media framing effects was conditional on the match between the content of the message and the physiological disposition of the message recipient. Coe and company replicated the classic Nelson, Clawson, and Oxley (1997) framing effect where tolerance of a Ku Klux Klan rally was contingent on whether media coverage framed the rally in terms of the Klan's free speech rights or the possibility of civic disorder resulting from the rally. They found that while the free speech frame was equally effective across participants, the civic disorder frame was uniquely effective among those who had a strong physiological threat reaction (measured similarly to Oxley et al., 2008). These studies

show that physiological dispositions condition not only baseline preference differences, as demonstrated in earlier physiological work, but also how people with different physiological traits will respond to different environmental stimuli.

The interplay between physiological dispositions and the political environment should continue to be explored. In addition to the mediation and moderation effects identified in these articles, researchers should be particularly sensitive to the role of selection in many of their questions. One of the ways physiological traits are most likely to influence political behavior is in the situations people select into. Coe et al. (2017) showed that physiological traits conditioned response to media messages, but physiological traits undoubtedly also condition a person's tendency to be exposed to certain messages in the first place. This selection behavior could enhance or inhibit the reactions identified in past research. The only way to get a real handle on these possibilities is to incorporate self-selection into the experimental designs (Gaines & Kuklinski, 2011).

Limitations of Psychophysiology Methods

In general, the authors are bullish about the potential of physiological measures like ectodermal activity (EDA) to enhance scholars' understanding of political behavior. As discussed throughout this article, these measures have already shed light on a number of important questions and set a path toward exciting new insights. However, as with any research method, researchers should proceed with a clear-eyed view of the limitations of physiological techniques. First, and most obviously, physiological measures are more difficult to obtain than self-reports. With the rise of internet surveys and the increasing prominence of Amazon's Mechanical Turk (MTurk) and related services, it has never been cheaper or easier to administer surveys to populations that are broadly representative of the general population. Meanwhile, physiological measures require participants to be in physical proximity to the researcher. This practical reality means that physiological samples tend to be small and geographically constrained.

Given these limitations, replication of research findings must be a particular emphasis in future physiological research. It will also be crucial for scholars working in this area to develop a set of common best practices for administering physiological measures.[8] Without a common set of procedures (and transparency about execution), there is a real danger that findings could be artifacts of the particular lab or idiosyncratic to the geographically constrained population under study. Of course, it should be noted that replication has been elusive across a host of research approaches, so scrutiny of physiological measures should be viewed in a broader context where replication is valued more generally.

A related concern about physiological research is the cost of implementing these studies, both in terms of money and time. Physiological equipment has been perceived as expensive relative to MTurk studies, and most political scientists are unfamiliar with its use as well as the underlying biological concepts necessary to conduct research utilizing that equipment. These concerns are real, but they also should not be overstated. Technologi-

cal advances have significantly reduced the cost of physiological equipment, and almost all of the costs are concentrated upfront in the purchase price of the equipment.[9] Participants in physiological studies are often paid more than typical experimental participants because of the inconvenience. However, skin conductance is minimally invasive and thus participants in EDA-based studies would not be exorbitantly expensive. In terms of learning curve costs, there are now several helpful reviews available to scholars interested in learning more about how to carry out this research (Hibbing et al., N.D.; Kreibig, 2010; Figner & Murphy, 2010). A decade ago, it made sense to be discouraged by the start-up costs of learning about these techniques, but at this point there are ample resources available, and researchers working in this area are eager to spread the word.

The final concern with skin conductance studies is that at some level, they are only as good as the stimuli they rely upon. As long as the electrodes are attached correctly and the equipment is properly calibrated, EDA measures will give a reliable report on affective arousal. How that signal is interpreted is where there is room for potential error. For example, consider the Oxley et al. (2008) study discussed in this article. Oxley and company showed participants images that had been rated as threatening (a large spider crawling on a human face, an open wound, and a man with a bloody face) and found that people who showed the largest skin conductance increase to those images also held conservative views on socially protective policies. It is certainly reasonable to consider those images "threatening," but it is by no means the only way to classify them. "Disgusting," "violent," or even just "bad" all seem to apply equally well. It also is not clear whether the affective reaction being picked up by EDA is the result of participants feeling threatened themselves or exhibiting some kind of empathy response for the people depicted in the images. Researchers should be careful not to jump to overbroad conclusions on the basis of a narrow interpretation of the stimuli.[10] Smith et al. (2011B) demonstrated one way to enhance the validity of the claims being made through thoughtful research design. Recall that Smith and company found that individuals with stronger skin conductance reactions to disgusting images were more likely to oppose gay marriage. One alternative explanation would be that disgust is too specific, and instead people were just reacting to "negative" or "aversive" images. To rule out this possibility, Smith et al. (2011B) substituted a set of images that had been pre-rated as comparably aversive to their disgusting images, but that were not rated as disgusting (e.g., a picture of a shark approaching a kayaker). When these images replaced the disgusting pictures, there was no discernible relationship between EDA and political attitude. In that case, disgust was the operative construct, but without careful theorizing, researchers are in danger of drawing erroneous conclusions from their EDA results.

Conclusion

Physiological measures, such as skin conductance, provide a powerful new tool for scholars of decision-making. Traditional approaches rely on self-reports that can be misleading for a variety of reasons. EDA allows measurement of affective reactions free of dissembling or lack of introspection. These emotional reactions appear to operate similarly to

other implicit measures in that they tap into mental processes that are largely independent and complementary of conscious self-reports. This suggests the need for scholars to study self-reports and physiological reactions side by side whenever possible. Future work should acknowledge that affective responses are conditioned by stable, individual-level dispositions, situational cues, and the interaction of the two. Whenever possible, this work should study both reactions to stimuli (as past research has done) and the influence of self-selection in shaping the environment people encounter. This research program has the potential to teach scholars a tremendous amount about how people think, feel, and reason about politics. To be sure, there are challenges ahead, but these challenges pale in comparison to the tremendous potential physiological techniques possess.

References

Aarøe, L., Petersen, M. B., & Arceneaux, K. (2017). The behavioral immune system shapes political intuitions: Why and how individual differences in disgust sensitivity underlie opposition to immigration. *American Political Science Review*, *111*, 277–294.

Albertson, B., & Gadarian, S. K. (2015). *Anxious politics: Democratic citizenship in a threatening world*. Cambridge, UK: Cambridge University Press.

Albertson, B., & Gadarian, S. K. (2016). Did that scare you? Tips on creating emotion in experimental subjects. *Political Analysis*, *24*, 485–491.

Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, *50*, 7–15.

Bizer, G. Y., Krosnick, J. A., Holbrook, A. L., Christian Wheeler, S., Rucker, D. D., & Petty, R. E. (2004). The impact of personality on cognitive, behavioral, and affective political processes: The effects of need to evaluate. *Journal of Personality*, *72*, 995–1028.

Bouchard, T. J., Jr. (2009). Authoritarianism, religiousness, and conservatism: Is “obedience to authority” the explanation for their clustering, universality and evolution? In E. Voland & W. Schiefenhövel (Eds.), *Biological Evolution of Religious Mind and Behavior* (pp. 165–180). Berlin, Germany: Springer.

Bradley, S. D., Angelini, J. R., & Lee, S. (2007). Psychophysiological and memory effects of negative political ads: Aversive, arousing, and well remembered. *Journal of Advertising*, *36*, 115–127.

Brader, T. (2006). *Campaigning for hearts and minds: How emotional appeals in political ads work*. Chicago, IL: University of Chicago Press.

Buelow, M. T., & Suhr, J. A. (2009). Construct validity of the Iowa gambling task. *Neuropsychology Review*, *19*, 102–114.

Campbell, A., Converse, P., Miller, W., & Stokes, D. (1960). *The American voter*. New York, NY: Wiley.

Cacioppo, J. T., Petty, R. E., Feinstein, J. A., & Jarvis, W. B. G. (1996). Dispositional differences in cognitive motivation: The life and times of individuals varying in need for cognition. *Psychological Bulletin*, *119*, 197–253.

Carlin, R. E., & Love, G. J. (2013). The politics of interpersonal trust and reciprocity: An experimental approach. *Political Behavior*, *35*, 43–63.

Coe, C. M., Canelo, K. S., Vu, K., Hibbing, M. V., & Nicholson, S. P. (2017). The physiology of framing effects: Threat sensitivity and the persuasiveness of political arguments. *Journal of Politics*, *79*, 1465–1468.

Converse, P. E. (1964). The nature of belief systems in mass publics. In D. Apter (Ed.), *Ideology and discontent*. New York, NY: Free Press.

Crider, A., Kremen, W. S., Xian, H., Jacobson, K. C., Waterman, B., Eisen, S. A., . . . Lyons, M. J. (2004). Stability, consistency, and heritability of electrodermal response lability in middle-aged male twins. *Psychophysiology*, *41*, 501–509.

Crone, E. A., & van der Molen, M. W. (2004). Developmental changes in real life decision making: Performance on a gambling task previously shown to depend on the ventromedial prefrontal cortex. *Developmental Neuropsychology*, *25*, 251–279.

Crone, E. A., & van der Molen, M. W. (2007). Development of decision making in school-aged children and adolescents: Evidence from heart rate and skin conductance analysis. *Child Development*, *78*, 1288–1301.

Dawson, M. E., Schell, A. M., & Filion, D. L. (2007). The electrodermal system. *Handbook of Psychophysiology*, *2*, 200–223.

Denburg, N. L., Recknor, E. C., Bechara, A., & Tranel, D. (2005). Psychophysiological anticipation of positive outcomes promotes advantageous decision making in normal older persons. *International Journal of Psychophysiology*, *61*, 19–25.

Ditonto, T. M., Lau, R. R., & Sears, D. O. (2013). AMPing racial attitudes: Comparing the power of explicit and implicit racism measures in 2008. *Political Psychology*, *34*, 487–510.

Dodd, M. D., Balzer, A., Jacobs, C. M., Gruszczynski, M. W., Smith, K. B., & Hibbing, J. R. (2012). The political left rolls with the good and the political right confronts the bad: Connecting physiology and cognition to preferences. *Philosophical Transactions of the Royal Society*, *367*, 640–649.

Federico, C. M. (2004). Predicting attitude extremity: The interactive effects of schema development and the need to evaluate and their mediation by evaluative integration. *Personality and Social Psychology Bulletin*, *30*, 1281–1294.

Figner, B., & Murphy, R. O. (2010). Using skin conductance in judgment and decision making research. In M. Schulte-Mecklenbeck, A. Kuehberger, & R. Ranyard (Eds.), *A*

handbook of process tracing methods for decision research. New York, NY: Psychology Press.

French, J. A., Smith, K. B., Alford, J. R., Guck, A., Birnie, A. K., & Hibbing, J. R. (2014). Cortisol and politics: Variance in voting behavior is predicted by baseline cortisol levels. *Physiology & Behavior*, *133*, 61–67.

Gerber, A. S., Huber, G. A., Doherty, D., & Dowling, C. M. (2011). The big five personality traits in the political arena. *Annual Review of Political Science*, *14*, 265–287.

Gerber, A. S., Huber, G. A., Doherty, D., Dowling, C. M., & Ha, S. E. (2010). Personality and political attitudes: Relationships across issue domains and political contexts. *American Political Science Review*, *104*, 111–133.

Gaines, B. J., & Kuklinski, J. H. (2011). Experimental estimation of heterogeneous treatment effects related to self-selection. *American Journal of Political Science*, *55*, 724–736.

Goudriaan, A. E., Oosterlaan, J., de Beurs, E., & van den Brink, W. (2006). Psychophysiological determinants and concomitants of deficient decision making in pathological gamblers. *Drug and Alcohol Dependence*, *84*, 231–239.

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, *74*, 1464.

Gruszczynski, M. W., Balzer, A., Jacobs, C. M., Smith, K. B., & Hibbing, J. R. (2013). The physiology of political participation. *Political Behavior*, *35*, 135–152.

Haidt, J., & Hersh, M. A. (2001). Sexual morality: The cultures and emotions of conservatives and liberals. *Journal of Applied Social Psychology*, *31*, 191–221.

Hetherington, M., & Suhay, E. (2011). Authoritarianism, threat, and Americans' support for the war on terror. *American Journal of Political Science*, *55*, 546–560.

Hibbing, J. R., Smith, K. B., & Alford, J. R. (2013). *Predisposed: Liberals, conservatives, and the biology of political differences*. New York, NY: Routledge.

Hibbing, M. V., Settle, J. E., Anspach, N., Carlson, T. N., Coe, C. M., Hernandez, E., . . . Arceneaux, K. (n.d.). Political psychophysiology: A primer for interested researchers and consumers. Unpublished manuscript.

Hinson, J. M., Jameson, T. L., & Whitney, P. (2002). Somatic markers, working memory, and decision making. *Cognitive, Affective, & Behavioral Neuroscience*, *2*, 341–353.

Ho, A. K., Sidanius, J., Pratto, F., Levin, S., Thomsen, L., Kteily, N., & Sheehy-Skeffington, J. (2012). Social dominance orientation: Revisiting the structure and function of a variable predicting social and political attitudes. *Personality and Social Psychology Bulletin*, *38*, 583–606.

Holbrook, T. M. (2006). Cognitive style and political learning in the 2000 US presidential campaign. *Political Research Quarterly*, *59*, 343–352.

Holbrook, A. L., & Krosnick, J. A. (2010). Measuring voter turnout by using the randomized response technique: Evidence calling into question the method's validity. *Public Opinion Quarterly*, *74*, 328–343.

Inbar, Y., Pizarro, D. A., & Bloom, P. (2009). Conservatives are more easily disgusted than liberals. *Cognition and Emotion*, *23*, 714–725.

Jarvis, W. B. G., & Petty, R. E. (1996). The need to evaluate. *Journal of Personality and Social Psychology*, *70*, 172–194.

Jost, J. T. (2006). The end of the end of ideology. *American Psychologist*, *61*, 651–670.

Jost, J. T., Glaser, J., Kruglanski, A. W., & Sulloway, F. J. (2003). Political conservatism as motivated social cognition. *Psychological Bulletin*, *129*, 339–375.

Kam, C. D., & Estes, B. A. (2016). Disgust sensitivity and public demand for protection. *Journal of Politics*, *78*, 481–496.

Keri, S., & Kiss, I. (2011). Oxytocin response in a trust game and habituation of arousal. *Physiology & Behavior*, *102*, 221–224.

Kosfeld, M., Heinrichs, M., Zak, P. J., Fischbacher, U., & Fehr, E. (2005). Oxytocin increases trust in humans. *Nature*, *435*, 673.

Kreibig, S. D. (2010). Autonomic nervous system activity in emotion: A review. *Biological Psychology*, *84*, 394–421.

Krumpal, I. (2013). Determinants of social desirability bias in sensitive surveys: A literature review. *Quality & Quantity*, *47*, 2025–2047.

LaPiere, R. T. (1934). Attitudes vs. actions. *Social Forces*, *13*, 230–237.

Lazarsfeld, P. F., Berelson, B., & Gaudet, H. (1948). *The people's choice*. New York, NY: Columbia University Press.

Lodge, M., & Taber, C. S. (2013). *The rationalizing voter*. New York, NY: Cambridge University Press.

Madsen, D. (1985). A biochemical property relating to power seeking in humans. *American Political Science Review*, *79*, 448–457.

Madsen, D. (1986). Power seekers are different: Further biochemical evidence. *American Political Science Review*, *80*, 261–269.

Marcus, G. E., Neuman, W. R., & MacKuen, M. (2000). *Affective intelligence and political judgment*. Chicago, IL: University of Chicago Press.

Merolla, J. L., Burnett, G., Pyle, K. V., Ahmadi, S., & Zak, P. J. (2013). Oxytocin and the biological basis for interpersonal and political trust. *Political Behavior*, *35*, 753–776.

Mondak, J. J., Hibbing, M. V., Canache, D., Seligson, M. A., & Anderson, M. R. (2010). Personality and civic engagement: An integrative framework for the study of trait effects on political behavior. *American Political Science Review*, *104*, 85–110.

Mutz, D. C. & Reeves, B. (2005). The new videomalaise: Effects of televised incivility on political trust. *American Political Science Review*, *99*, 1–15.

Nelson, T. E., Clawson, R. A., & Oxley, Z. M. (1997). Media framing of a civil liberties conflict and its effect on tolerance. *American Political Science Review*, *91*, 567–583.

Osumi, T., & Ohira, H. (2010). The positive side of psychopathy: Emotional detachment in psychopathy and rational decision making in the ultimatum game. *Personality and Individual Differences*, *49*, 451–456.

Oxley, D. R., Smith, K. B., Alford, J. R., Hibbing, M. V., Miller, J. L., Scalora, M., . . . Hibbing, J. R. (2008). Political attitudes vary with physiological traits. *Science*, *321*, 1667–1670.

Pérez, E. O. (2016). *Unspoken politics: Implicit attitudes and political thinking*. New York, NY: Cambridge University Press.

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In R. E. Petty & J. T. Cacioppo (Eds.), *Communication and persuasion: Central and peripheral routes to attitude change* (pp. 1–24). New York, NY: Springer.

Pratto, F., Sidanius, J., Stallworth, L. M., & Malle, B. F. (1994). Social dominance orientation: A personality variable predicting social and political attitudes. *Journal of Personality and Social psychology*, *67*, 741.

Renshon, J., Lee, J. J., & Tingley, D. (2015). Physiological arousal and political beliefs. *Political Psychology*, *36*, 569–585.

Ring, P. (2015). The framing effect and skin conductance responses. *Frontiers in Behavioral Neuroscience*, *9*, 188.

Schell, A. M., Dawson, M. E., Nuechterlein, K. H., Subotnik, K. L., & Ventura, J. (2002). The temporal stability of electrodermal variables over a one-year period in patients with recent-onset schizophrenia and in normal subjects. *Psychophysiology*, *39*, 124–132.

Schuman, H., & Presser, S. (1981). *Questions and answers: Experiments on question form, wording, and context in attitude surveys*. New York, NY: Academic Press.

Smith, K. B., Oxley, D. R., Hibbing, M., Alford, J., & Hibbing, J. R. (2011a). Linking genetics and political attitudes: Re-conceptualizing political ideology. *Political Psychology*, *32*, 369–397.

Smith, K. B., Oxley, D., Hibbing, M. V., Alford, J. R., & Hibbing, J. R. (2011b). Disgust sensitivity and the neurophysiology of left-right political orientations. *PLOS One*, *6*, e25552.

Soroka, S. N. (2014). *Negativity in democratic politics: Causes and consequences*. New York, NY: Cambridge University Press.

Soroka, S., Fournier, P., & Nir, L. (2017). A cross-national, psychophysiological study of the connection between negativity biases and political preferences. Unpublished manuscript.

Starcke, K., Tuschen-Caffier, B., Markowitsch, H.-J., & Brand, M. (2009). Skin conductance responses during decisions in ambiguous and risky situations in obsessive compulsive disorder. *Cognitive Neuropsychiatry*, *14*, 199–216.

Taylor, S. E. (1991). Asymmetrical effects of positive and negative events: The mobilization-minimization hypothesis. Psychological Bulletin, *110*, 67–85.

Tourangeau, R., Rips, L. J., & Rasinski, K. (2000). *The psychology of survey response*. New York, NY: Cambridge University Press.

Van Hiel, A., & Mervielde, I. (2002). Explaining conservative beliefs and political preferences: A comparison of social dominance orientation and authoritarianism. *Journal of Applied Social Psychology*, *32*, 965–976.

Van't Wout, M., Kahn, R. S., Sanfey, A. G., & Aleman, A. (2006). Affective state and decision making in the ultimatum game. *Experimental Brain Research*, *169*, 564–568.

Verba, S., & Nie, N. H. (1972). *Participation in America*. New York, NY: Harper & Row.

Wagner, M. W., Deppe, K. D., Jacobs, C. M., Friesen, A., Smith, K. B., & Hibbing, J. R. (2015). Beyond survey self-reports: Using physiology to tap political orientations. *International Journal of Public Opinion Research*, *27*, 303–317.

Wahlke, J. C., & Lodge, M. G. (1972). Psychophysiological measures of political attitudes and behavior. *Midwest Journal of Political Science*, *16*, 505–537.

Zaller, J. (1992). *The nature and origins of mass opinion*. Cambridge, UK: Cambridge University Press.

Notes:

(1.) This article uses skin conductance and electrodermal activity (EDA) interchangeably. For technical discussion of different versions of EDA measures, see Hibbing et al. (n.d.).

(2.) These results also should give some pause to researchers who study the relationship between self-reported disgust sensitivity and political beliefs without accounting for physiological disgust reactions (e.g., Kam & Estes, 2016; Aaroe, Petersen, & Arceneaux, 2017), for fear that their accounts may be incomplete.

(3.) See Buelow and Suhr (2009) for a discussion of the IGT method.

(4.) Given the IGT's origins in clinical research, it is not surprising to find studies examining affect and task performance among groups with mental health conditions. See Starcke, Tuschen-Caffier, Markowitsch, and Brand (2009) for a similar design comparing obsessive-compulsive disorder participants with neurotypical controls.

(5.) See Kreibig (2010) and Figner and Murphy (2010) for general overviews of skin conductance in decision-making research.

(6.) Douglas Madsen deserves similar credit for his pioneering research on serotonin and political power-seeking conducted during the 1980s (Madsen, 1985, 1986). Though neurotransmitter research is tangential to the focus here, several pieces are highlighted that have particular relevance, especially since this research has been generally more focused on decision-making than much of the skin conductance work in political science.

(7.) One additional study, Merolla, Burnett, Pyle, Ahmadi, and Zak (2013), examined the influence of the neurotransmitter oxytocin on political trust. Oxytocin has been shown to be related to differences in interpersonal trust (Kosfeld, Heinrichs, Zak, Fischbacher, & Fehr, 2005), but prior to the Merolla et al. (2013) study had not been examined in the context of political trust. They found evidence that an experimentally treated group with elevated oxytocin showed increased levels of political trust, at least under some conditions, relative to a control group.

(8.) See Hibbing et al. (n.d.) for a first attempt at establishing best practices in skin conductance research.

(9.) The system used in the authors' lab, purchased from BioPac, cost approximately $4,000, more than the cost of a lot of equipment used in political psychology, but far less than fMRI scanners, for example.

(10.) Recall that Oxley et al. (2008) enhanced the validity of their claim by replicating the finding with a different physiological measure (blink amplitude) and a different stimulus that was more directly threatening to participants (white noise). The point here is not to critique that specific piece, but to illustrate the ways that stimuli can be interpreted in multiple ways.

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