Neural nonpartisans

While affective conflict between partisans is driving much of modern politics, it is also driving increasing numbers to eschew partisan labels. A dominant theory is that these self-proclaimed independents are merely covert partisans. In the largest functional brain imaging study of neuropolitics to date, we find differences between partisans and nonpartisans in the right medial temporal pole, orbitofrontal/medial prefrontal cortex, and right ventrolateral prefrontal cortex, three regions often engaged during social cognition. These results suggest that rather than being simply covert partisans, nonpartisans process the world in a way different from their partisan counterparts.

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The past two decades of American politics have been marked by increasing polarization between partisans at the level of both elected officials (Theriault 2008) and voters (Huddy, Mason, and Aarøe 2015; Mason 2018). Americans are far more likely to report strong conflict between partisans than any other social cleavage, including race, wealth, and age (Iyengar, Sood, and Lelkes 2012). This conflict is driving intense negative emotions between voters, including elevated levels of fear, anger, and frustration (Pew Research Center for the People and the Press 2016).

Political science has responded to the rising tide of polarization with a wave of scholarship seeking to address its nature, origins, and implications. Some scholars have developed sophisticated measures to quantify the growing distance between partisans (Poole and Rosenthal 1984). Others have sought its roots in realignment (Sundquist 1983), policy (Webster and Abramowitz 2017), biology (Hibbing, Smith, and Alford 2013), moral foundations (Haidt 2012), personality (Gerber et al. 2011), or social dynamics (Mason 2018). The claimed consequences are broad, with concerns about civil discourse, policy outcomes, faith in government, legislative quality, and political engagement (Barber and McCarty 2016).

In the midst all this scholarship about increasing partisan extremism, far less attention has been focused on nonpartisans, citizens who do not primarily identify with one party or another. On the face of it, the diminished attention to nonpartisans is surprising given that significantly more people identify as independents than identify with either party (Jones 2018) and that independents are increasingly disengaging from politics (Klar and Krupnikov 2016). However, political scientists have developed a deep skepticism about how independent these independents actually are, given that they often vote with one party or the other (Keith et al. 1992; Hawkins and Nosek 2012). Regardless of their voting behavior, the roughly 40% of the electorate that claims to be independent or nonpartisan are engaging in an interesting and important political act

when they eschew a party label. One interpretation of the rejection of partisan identity is that this behavior reflects nonpartisan/independent itself as a social identity.

In this paper, we use functional brain imaging of a simple risk-related decision-making task to investigate differences between voters who registered with one of the two main parties and those who chose not to register with a party. We find significant differences in brain activity during outcomes of risky decisions relative to safe choices in a set of brain regions that have a role in social cognition, among other functions. Rather than being merely partisans who do not ascribe to labels, the results suggest that nonpartisans are differentiable in the way they engage even nonpolitical tasks and hint at new avenues for understanding how they differ from partisans.

Understanding Partisans and Nonpartisans

Three explanations for polarization

One of the puzzles emerging from the climate of political polarization is the level of emotional intensity in the conflict between those on the left and right. It is possible to model disagreements, policy preferences, and many of the political dynamics we observe today as the result of a spatial framework of issues and ideology based on rational decision making and devoid of rancor (Hinich and Munger 1997). But people report powerful emotions against partisans from the other side that appear ingrained and automatic, with a level of animus and discrimination comparable to racism (Iyengar and Westwood 2015). Given that we can get so much traction from models of purely ideological polarization, why do we observe such affective polarization in the real world?

One potential explanation is that while elected officials and party activists might have substantially different positions, the electorate has little actual polarization (Fiorina and Abrams

2009). In this view, while elites have been fighting using increasingly heated rhetoric and media fuel this for an advantage in viewership, citizens remain more centrist ideologically (Fiorina, Abrams, and Pope 2005). If so, we could infer that voters might only mirror some of the affective language that they are exposed to, but without the emotional intensity of the elites that are propagating it in the political discourse.

A second alternative is that the masses and elites are both moving from the center. Voters are not merely occasionally mimicking sound bites, but actually altering their positions in the political debates. In this view, the real antipathy of partisan voters for those on the other side is driven by policy disagreements (Rogowski and Sutherland 2016). As partisan voters become more ideologically distant from those on the other side, negative emotions about the opposition grow (Webster and Abramowitz 2017). The consequence is real ideological and affective polarization driven by sharpening differences over policies of great consequence (Abramowitz and Webster 2016).

A third theory attracting considerable attention recently is that mechanisms similar to those behind racism drive affective polarization (Iyengar, Sood, and Lelkes 2012). Thus, party identification becomes a central component of people's social identity, regardless of any meaningful differences in policy goals. The intense emotional conflict between partisans then is not a dispute about issue positions, but rather an 'us versus them' dynamic familiar in social psychology (Mason 2018).

Social identity theory

In social identity theory (Tajfel 1970), the mere sorting of individuals into groups is sufficient to lead to a range of discriminatory beliefs, emotions, and behaviors. Whereas previous generations of scholarship had attributed intergroup tensions to a range of sources including historical animosity or resource scarcity, subsequent research using a 'minimal group

paradigm' showed that bias in favor of members of the ingroup and negative affect towards the outgroup could be created by just arbitrarily divvying people into clusters, in the absence of any of the factors typically suggested as causes of ingroup bias (Cikara and Van Bavel 2014).

In one minimal group experiment, a participant played a 'cyberball' game where they pressed buttons to pass a ball on a computer screen to either individual A or individual B. After a period of time, A and B (who, unknown to the participant, are computer algorithms) only pass the ball to each other and the participant is excluded from the game, leading to negative emotions, lost sense of control, and feeling that they do not belong. Being excluded during cyberball games also leads to greater activity in a brain region connected with experiencing physical pain (Eisenberger, Lieberman, and Williams 2003). When simple, and apparently inconsequential, social sorting such as cyberball can lead to deleterious consequences; it is perhaps not surprising that large-scale social divisions bring broader impacts.

While partisans are by definition sorted into groups, Lilliana Mason (2018) has contended that the emotional intensity of conflict between partisans is exacerbated by the degree to which party affiliation is increasingly aligned with other social identities. As religion, race, and ideology become associated with party identification, the number of crosscutting cleavages is reduced and affective tensions between partisans increase. When individuals experience a high degree of social sorting, they are correspondingly more isolated from outgroups and more prone to anger in the face of a potential threat (Mutz 2002a).

Nonpartisans

With partisanship becoming a central cleavage in American politics and with social identity theory emphasizing the importance of group affiliation, it is particularly fascinating that a growing portion of the electorate is choosing not to identify with either party. Many individuals react with signs of physiological stress when encountering affectively charged

political debate, as compared to civil discourse. And, that stressful incivility leads to a greater distrust in government and its institutions (Mutz and Reeves 2005).

The affective polarization discussed previously thus drives an increasing number of citizens away from party politics, leading to the greater number of self-declared nonpartisans. While individuals who are well sorted, with policy attitudes and social identities that align with their partisan identities may increase in their emotional intensity and engagement with politics (Mason 2018), those who are cross-pressured end up with more ambivalent political views and a tendency to disengage (Mutz 2002b). Some of the rise in apparent polarization may be driven by a reduction in the willingness of more centrist individuals to even participate in political surveys (Cavari and Freedman 2018). Thus, Samara Klar et al. (2018) argue that polarization is driven by the one-third of Americans with strong party affiliation, with many more wanting to avoid politics altogether. Some Americans' social identity may be tightly tied to their party, but for others rejecting these labels is central.

Consistent with the social identity interpretation, while partisans are more likely to give to co-partisans (e.g. Democrats giving to Democrats) in a dictator game, nonpartisans are less likely to give to those identified as partisans and more likely to give to fellow nonpartisans than an unidentified stranger (Fowler and Kam 2007). While negative partisanship is an important driver of many of the dynamics of contemporary politics (Abramowitz and Webster 2016), negative nonpartisanship is an often underappreciated side effect (Greene 1999; Klar 2014).

In an era of increasing polarization, why do some individuals reject party labels by registering as nonpartisans (thus losing the right to participate in some primary votes), discriminate against partisans, have negative affect towards partisans, and then vote with those same parties they are rejecting? The dominant tendency in the literature has been to dismiss the choice to self-identify as nonpartisan. More recent scholarship points to suggests negative

stereotypes about partisans and a desire to not be associated with partisanship (Klar and Krupnikov 2016; Klar, Krupnikov, and Ryan 2018). Social identity theory suggests that even the rejection of group membership may be an important form of social identity. The tendency of some nonpartisans to vote along party lines makes this social identity even more curious.

Biology and partisanship

While the basic tendency to affiliate with groups appears extraordinarily strong in humans, like other highly social animals (Stanton and Mann 2012) we also vary in our tendency to affiliate. A large portion of variation in group identification is attributable to genetic factors (Weber, Johnson, and Arceneaux 2011). Partisan attachment in particular has been shown to be heritable (Settle, Dawes, and Fowler 2009; Hatemi et al. 2009). While the tendency to affiliate with a party and ideology have heritable components, affiliation with a particular party is not heritable (Hatemi and McDermott 2012).

Biological correlates of differences between partisans have also been identified. Republicans and Democrats can be correctly classified based on brain activity during a gambling task with 83% accuracy (Schreiber et al. 2013). Brain imaging has shown differences between liberals and conservatives in both brain structure (Kanai et al. 2011; Nam et al. 2018) and function (Ahn et al. 2014; Pedersen, Muftuler, and Larson 2018). While these studies have noted activation differences between liberals and conservatives in brain activity during nonpolitical tasks, committed members of both parties activate regions of the brain that are characteristic of social cognition while engaging in political cognition (Fowler and Schreiber 2008; Westen et al. 2006), even as political novices deactivate the same areas (Fowler and Schreiber 2008) (For reviews of the intersections between neuroscience and politics see: Jost et al. 2014; Haas 2016; Schreiber 2018).

These results do not imply that the biological differences in ideology or party affiliation are entirely driven by biological factors. Rather, evidence suggests that the differences found in the brain are simply too strong to be solely attributed to heritability and are instead being influenced by environmental factors or choices of the individuals (Schreiber et al. 2013). Our biology appears to predispose these tendencies, rather than determine them (Hibbing, Smith, and Alford 2013).

Since differences between partisans in brain structure and brain function persist even when these individuals are not engaged in political cognition and since social identity is a dominant factor in current theories of both partisanship and nonpartisanship we theorized:

> Theory 1: Nonpartisans differ from partisans in activation of brain regions central to social cognition, even when the task at hand is not essentially social.

The brain regions most frequently differentiating partisans from each other in studies of both brain structure and function (Kanai et al. 2011; Schreiber et al. 2013; Ahn et al. 2014; Nam et al. 2018; Pedersen, Muftuler, and Larson 2018) have been frequently implicated in risk-related decision-making (Gowin, Mackey, and Paulus 2013; Orsini et al. 2015). Believing that nonpartisanship too may be a form of social identity with implications for risky decision making we theorized:

> Theory 2: Nonpartisans differ from partisans in activation of brain regions central to risk-taking.

Function Brain Imaging of Partisans and Nonpartisans while Gambling

While much of the existing neuropolitics literature has focused on differences among partisans (Jost et al. 2014; Schreiber 2018), little has been done to explore distinctions between partisans and nonpartisans. To investigate these dissimilarities we analyzed brain imaging data

in a sample of 110 participants who underwent functional magnetic resonance imaging (fMRI) as they engaged in a task designed to examine risk related choices between options that provided a guaranteed payoff or those that provided a chance for either losses or gains. In fMRI studies, a series of images of the brain are taken to reveal slight changes in levels of oxygen rich blood flow to specific regions of the brain to infer activity in those regions (For an introduction to the methods used in neuropolitics see Haas (2016)). In previous research, brain activity during this task had been shown to differentiate partisans (Schreiber et al. 2013), so we expected that it might help to distinguish partisans from nonpartisans.

After the experiment, we were able to match participants with publicly available voting records. Thus, we could identify participants who were registered as Republicans or Democrats (partisans) or were registered as No Party Preference (nonpartisans). The reanalysis of imaging data originally collected for other purposes means that we are restricted to matching participants' identities to public voting records rather than being able to use familiar and well-validated measures of partisanship, identity, and ideology (Huddy, Mason, and Aarøe 2015; Theodoridis 2017). However, the benefits of nonpartisans' registration as a measure of party affiliation are that it is behavioral, politically meaningful, and imposes a real world cost on the participant[1]. To the extent that some nonpartisans may still feel a social identity affiliation with a party, registration data provides a conservative test (see appendix) and evidence of differences in brain activity between partisans and nonpartisans during nonpolitical tasks would be only more surprising.

[1] During the period when the data in this study was collected, California operated under a "modified" closed primary as a consequence of Senate Bill 28. Participants who registered with No Party Preference would thus only obtain a ballot in primary elections for nonpartisan elections, unless they took the effort of requesting a ballot for a particular party for that specific election.

Participants

Participant groups were composed of 73 partisans (56 Democrats and 17 Republicans) and 37 non-partisans who did not differ with regard to age ($F(1, 108)= 0.87$, $p = 0.353$; Partisan mean age (SD) = 22.84(7.53); Non-partisan mean age (SD) = 21.61(3.27), Partisans (40 females, 33 males) and non-partisans (15 females, 22 males); $\chi^2= 1.466$, $p = 0.226$). Participants gave informed written consent approved by the UCSD Human Research Protection Program. We acquired voter registration records from San Diego County in March 2008 that included party of registration and electoral turnout history, and names, addresses, and phone numbers to ensure exact matches to subjects who participated in the functional brain imaging study.

Risky-Gains Task

For the Risky-Gains task (Paulus et al. 2003), participants were presented with three numbers in ascending order (20, 40, and 80). Each number was presented on the screen for one second and if the participant pressed a button when the number was shown on the screen, he/she received the number of points shown on the screen. The participants were informed that for both 40 and 80 points there was a chance that a 40 or 80 in red color might appear on the computer screen which signaled that the participant lost 40 or 80 points, respectively. Thus, although the participant may have gained more points per trial by waiting until a 40 or 80 appears on the screen, there was also a risk of losing 40 or 80 points. The probabilities of presenting a negative 40 or 80 are such that a participant's final score would be identical were they to consistently select 20, 40, or 80. Thus, there was no inherent advantage to select the risky response (40 or 80) over the safe response (20). Each trial lasted 3.5 s irrespective of the participant's choice and the participant received rewarding feedback (stimulus on the screen and auditory sound) immediately after selecting a response.

Statistical analyses

Since no previous studies had compared brain activity in partisans with nonpartisans and we had a conservative, though real world, measure of nonpartisanship, we elected to take a more exploratory strategy to analyzing the imaging data. We therefore constrained the number of brain regions that we evaluated using a region of interest (ROI) approach and did not correct for multiple comparisons. To explore the first theory, we identified a set of ROIs that are frequently implicated in social cognition. We used peak activations from the Neurosynth metanalysis database for the term social (http://neurosynth.org/analyses/terms/social/). Neurosynth "uses text-mining, meta-analysis and machine-learning techniques to generate a large database of mappings between neural and cognitive states" (Yarkoni et al. 2011) and is a frequently used tool for focusing inquiries about hypothesized cognitive functions and specific patterns of brain activity (e.g. Schmälzle et al. 2015). Numerous studies and meta-analyses using Neurosynth have demonstrated and validated the role of these brain regions in social cognition (Stanley and Adolphs 2013; Schmälzle et al. 2017; Tso et al. 2018). We thus obtained a set of ROIs in the medial, superior, inferior, and orbito-frontal gyri; the middle and superior temporal gyri; and the medial posterior cortices.

Theory two involved a much narrower set of ROIs (amygdala, insula, and anterior cingulate) frequently implicated in studies of risk taking and demonstrating differences between partisans in the risky-gains task (see Schreiber et al. 2013 for a description of these ROIs). Activity in these regions had previously been shown to differentiate individuals on political left or right in studies of brain structure (Kanai et al. 2011) and function (Schreiber et al. 2013; Ahn et al. 2014; Pedersen, Muftuler, and Larson 2018). Although we were focused on differences between partisans and nonpartisans, we conjectured that the same regions differentiating the political poles might also be implicated in distinguishing the nonpartisans.

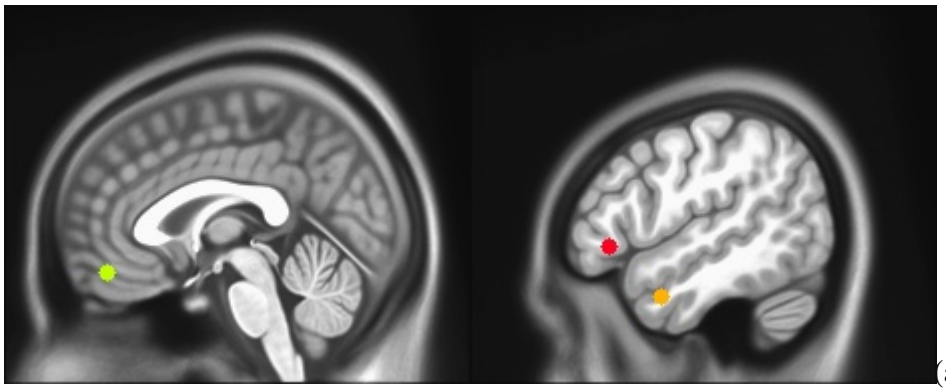
ROI masks were used to define the volume within which, for each participant, mean voxel-wise percent signal change for the contrast of interest (Win Risky – Win Safe) (e.g. when the participant was rewarded a larger sum of money as the result of a successful risky decision in contrast to when they were paid a smaller sum for choosing the safe outcome) were extracted. As this was the first study looking specifically at brain function in nonpartisans, we did not correct for multiple comparisons in order to maximize our power to detect potential differences with partisans (i.e. to minimize false negatives), with the side effect of increasing the potential for false positives.

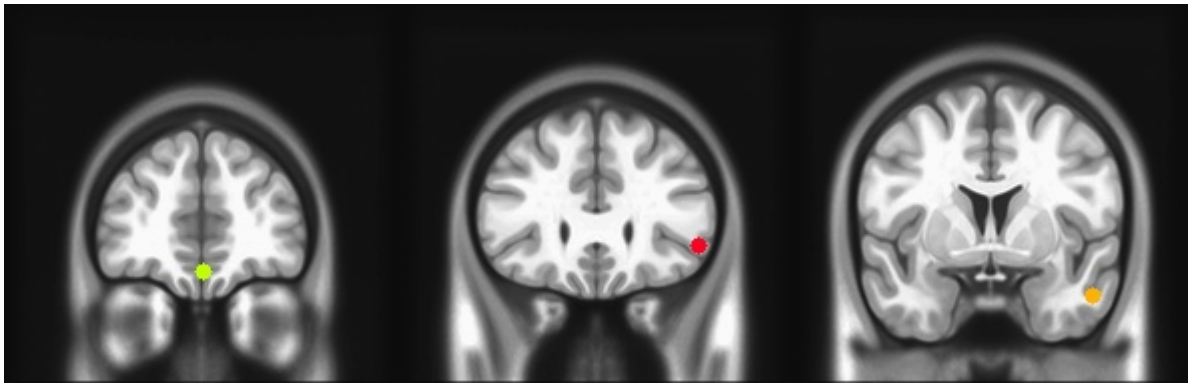
Finally, we analyzed potential differences between partisans and nonpartisans in risk related choices during the scanning. The percentage of trials chosen for each condition (20, 40, 80) was calculated for each participant as a function of prior trial punishment (yes or no), yielding six frequency measures for each participant (20 with prior trial punishment, 20 w/o prior trial punishment, etc.). These frequencies were subjected to a linear mixed model with a random intercept and fixed effects of age, income, magnet tesla (3 vs. 1.5 Tesla, effects-coded), risk level (20, 40, 80), the prior trial punishment x risk level interaction (differences in frequencies of selecting each trial type as a function of prior trial punishment), the partisanship x risk level interaction (differences in risk taking as a function of partisanship), and the risk level x prior trial punishment x partisanship interaction (differences in the effect of prior trial punishment on risk taking behavior as a function of prior trial punishment). The interaction effects with partisanship were the primary effects of interest.

Partisans and Nonpartisans differ in activity in three brain regions

While none of the risk-related ROIs (Theory 2) that differentiated partisans from each other distinguished them from nonpartisans (all p's > 0.16), we did find differences in three

regions: the right medial temporal pole, orbitofrontal/medial prefrontal cortex, and right ventrolateral prefrontal cortex, which have been implicated in social cognitive processing (**See Figure 1**). The results of the general linear model revealed a significant effect of partisanship ($F = 4.975$, $p = 0.028$) on brain activation in the right medial temporal pole (MNI center of mass: 52, 4, -34) for the contrast of Win Risky vs. Win Safe trials, with non-partisans displaying significantly greater activation relative to partisans. There was a significant effect of partisanship in the orbitofrontal/medial prefrontal cortex ROI (MNI center of mass: 1, 47. -19) on brain activation for Win Risky vs. Win safe trials ($F = 4.013$, $p = 0.048$), again with non-partisans displaying significantly greater activation than partisans. Finally, there was a marginally significant brain activation difference between partisans and non-partisans in the right ventrolateral prefrontal cortex (inferior frontal gyrus p. orbitalis; MNI center of mass: 52, 30, -4) ($F = 2.955$, $p = 0.088$), with non-partisans displaying a trend towards greater activation relative to partisans. The factors of age, income level, and magnet tesla did not significantly predict brain activation for the region in the any of the three ROIs (rMTP (all $p's > 0.09$), mOFC (all $p's > 0.389$), rVLPFC (all $p's > 0.26$)).


(a)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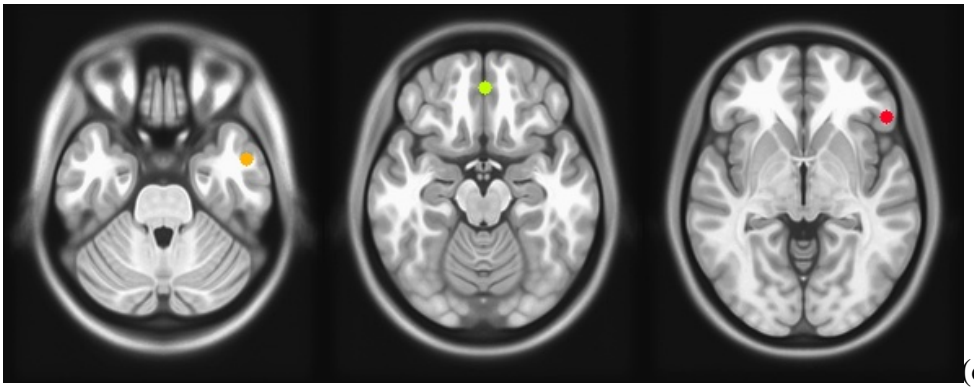
(c)

Figure 1. Differences in activity in three brain regions. Brain activity differed in the right medial temporal pole (orange), medial orbitofrontal/medial prefrontal cortex (green), and right ventrolateral prefrontal cortex (red) as see in sagittal (a), coronal (b), and axial (c) views of the brain. Each of these circles represents the peak point of activation in the cluster extracted using Neurosynth.

No Behavioral Differences between Nonpartisans and Partisans

The linear mixed model revealed, as expected, a significant effect of risk level on frequency of trials selected ($F = 222.75, p < 0.001$) and a significant interaction of risk level and prior trial punishment ($F = 39.06, p < 0.001$), but no significant effect of partisanship x risk taking ($F = 0.04, p = 0.84$) and no significant effect of partisanship x risk taking x prior trial punishment ($F = 0.34, p = 0.56$).

Discussion

This investigation aimed to examine the brain processing differences during risk-related decision-making outcomes in partisans and nonpartisans. If self identified independents or nonpartisans were merely covert partisans in disguise (Keith et al. 1992), we would not expect there to be observable differences in brain activity between partisans and nonpartisans, especially for a task that is not apparently related to partisan identification or political cognition. The results here, however, suggest that nonpartisans and partisans differ in their brain activity during nonpolitical tasks (paralleling brain imaging studies of nonpolitical tasks differentiating the left and right (Schreiber et al. 2013; Ahn et al. 2014; Pedersen, Muftuler, and Larson 2018). The nonpartisans and partisans differ in their engagement of three regions known for their role in social cognition (the right medial temporal pole, orbitofrontal/medial prefrontal cortex, and right ventrolateral prefrontal cortex) during the gambling task.

Social cognition in three brain regions

As noted previously, politically engaged partisans demonstrated activity in regions of the brain central to social cognition during political activity such as reasoning about information threatening to candidates they support (Westen et al. 2006) or answering political questions (Fowler and Schreiber 2008). The partisans and nonpartisans in the risky gains task are differing

in their activation of the right medial temporal pole, orbitofrontal/medial prefrontal cortex, and right ventrolateral prefrontal cortex, but the task is not obviously political in nature. While disengagement from politics has been highlighted as a consequence of identifying as a political independent (Klar and Krupnikov 2016), this nonpolitical task seems to highlight differences in more fundamental processes that are applicable beyond the political context. When comparing the partisans with nonpartisans, the regions differentiating their brain activity play important roles in social cognition.

The temporal pole

Early studies of the temporal pole in nonhuman primates demonstrated that damage to the area led to dramatic social impacts, with monkeys unable to connect to their social groups (Myers and Swett 1970) among other severe social symptoms. Subsequent studies in humans found similar social impairments, particularly after damage to the right temporal pole through disease or trauma (Thompson, Patterson, and Hodges 2003). Along with functional brain imaging studies, mounting evidence has led to a view of the temporal poles as important for connecting social and emotional processing (Olson, Plotzker, and Ezzyat 2007).

One critical ability for social functioning is the capacity for theory of mind, the ability to contemplate mental states, both of oneself and others. While regions like the medial prefrontal cortex and temporoparietal junction are often implicated in theory of mind, the temporal pole is also an important part of this mentalizing network (Mar 2011). Converging lines of evidence from fMRI experiments, analyses of resting state data, and metanalyses demonstrate that the temporal pole plays a role in the mentalizing network and is also involved in autobiographical processes, such as when a person considers their past or imagines their future (Andrews-Hanna, Saxe, and Yarkoni 2014).

The orbitofrontal/medial prefrontal frontal cortex

The second significant difference in brain activity is found in the region of interest overlapping the medial prefrontal cortex and the orbitofrontal cortex. The medial prefrontal cortex has been noted as a key component of the brain's mentalizing network (Amodio and Frith 2006) as well as more broadly implicated in a range of core social cognition tasks, connected to its role in the default mode network (Mars et al. 2012). The default mode network is a set of brain regions that are highly metabolically active even at rest, interconnected anatomically and functionally, and appear to be central to integrating the brain's other networks (Raichle 2015). Numerous lines of evidence tie the medial prefrontal cortex to both social cognition and the resting state of the brain, suggesting that it is key in both actively engaging in the social world and also passively processing our role in previous or future social engagement (Spreng and Andrews-Hanna 2015).

Intriguingly, being excluded in the cyberball game discussed above leads to enhanced connectivity across the mentalizing network, including the particular region of the medial prefrontal cortex that differentiates partisans and nonpartisans in the present study. Those with the most dramatic changes in mentalizing connectivity during exclusion also had less dense social networks (Schmälzle et al. 2017). Furthermore, social network size varied with anatomical size of the ventromedial prefrontal cortex (Noonan et al. 2018).

The function of the orbitofrontal cortex is far more contested. While about fifty papers are published each month focusing on its function, the ability to integrate competing claims into compelling interpretations has been lacking (Stalnaker, Cooch, and Schoenbaum 2015). Converging lines of evidence do point to a role in encoding state spaces (Wikenheiser and Schoenbaum 2016), which might be why the orbitofrontal cortex is so frequently implicated in studies of economic choice, valuation, and decision-making (Gourley et al. 2016).

The region was also central to the development of Antonio Damasio's (1996) somatic marker hypothesis connecting emotions with decision-making. Given the intense affect generated around political decisions in the polarized environments, despite relatively small policy preference differences, the differentiation in activity in this area for partisans and nonpartisans is intriguing in its broader role in social cognition. Patients with damage in the orbitofrontal cortex could successfully make judgments about political candidates' social traits based on appearance, however they could not use those judgments to inform their political choices as healthy individuals could (Xia et al. 2015).

The right ventrolateral prefrontal cortex

The right ventrolateral prefrontal cortex has been implicated widely in cognitive control (Levy and Wagner 2011) including the control of our own reactions when we mentalize about the thoughts of others (Vogeley et al. 2001). It has been posited to be part of a controlled and reflective brain system that helps manage our automatic and reflexive reactions, including to social interactions. For instances, increased activity in the right ventrolateral prefrontal cortex during conscious deliberation has been shown to decrease automatic amygdala activity in response to racial stimuli (Lieberman et al. 2005).

Similarly, this region has also been shown to be important in reducing the pain we feel from social exclusion and the activity in a pain related brain region during the cyberball game (Eisenberger, Lieberman, and Williams 2003). During temporary electrical stimulation of the right ventrolateral prefrontal cortex, individuals were more likely to regulate negative emotions around social exclusion, supporting a causal role for the region in emotional regulation (He et al. 2018).

Potential neurocorrelates of nonpartisanship

Understanding more fully how these brain regions differ in function between partisans and nonpartisans may help illuminate the connections between social identity, affect, and political decisions. Each of the three regions is implicated in the complexities of maintaining healthy social connections through understanding the mental states of others or managing our cognitive and emotional reactions to social exclusion. Self-declared nonpartisans are particularly high in self-monitoring and attending to the thoughts of others, which Klar and Krupnikov (2016) theorize is driving their declarations of political independence. Partisans and nonpartisans differ in how they construct their social identity in an era when political identity is particularly entwined with intense emotions and strident social exclusion (Pew Research Center for the People and the Press 2016). In such a context, it may not be surprising that nonpartisans differ from partisans in how they engage their brains to process the nonpolitical world as well.

The current study demonstrates differences in three brain regions between nonpartisans and partisans while they engage in a nonpolitical task. While previous neuropolitics research has shown activity in social brain regions for political tasks (Westen et al. 2006; Fowler and Schreiber 2008; Xia et al. 2015), the results here indicate differences that go beyond just politics. Previous research suggests that being politically independent appears to be a political identity in its own right rather than merely an absence of a political identity or ideology (Klar 2014). But as Klar (2014, 588) notes "We are left with a lingering question: what is the source of political identity importance?"

Limitations and Future Directions

One possibility is that differences in political identity importance are a consequence of neurological differences. While the present work differentiates partisans and nonpartisans in terms of brain activity, it is unable to inform theories about causal connections between the

neurological differences and partisan or nonpartisan identity. For a number of reasons, brain imaging studies are a poor fit for such queries (see Tingley 2006; Theodoridis and Nelson 2012). As a consequence, this paper is more akin to an existence proof that there are neurological differences between partisans and nonpartisans, than a definitive explanation of those differences. Making a definitive explanation is impossible because of the inherent problems of making the reverse inference from brain activity to the mental processes it creates (Jost et al. 2014). Future studies will be needed to help clarify what implications come from the brain activity differences identified here.

Potential differences in sensitivity to social exclusion or differences in social network density or size between partisans and nonpartisans are possibilities for further investigation based on the brain activity differences identified here. One of the promises of neuropolitics has been that brain imaging studies may lead to new hypotheses about the nature of political phenomena (Lieberman, Schreiber, and Ochsner 2003). While it is important that additional brain imaging studies be used to validate and extend the very tentative findings in this paper, many implications from these findings could be tested with methods more familiar to political science including online social games like cyberball and social network analysis of partisans and nonpartisans.

If nonpartisans are more prone to self-monitoring (Klar and Krupnikov 2016) and activate brain regions involved in mentalizing and self-monitoring, then we may expect that their behaviors and neurology will differ from partisans across a range of related contexts. Hopefully, the present work will lay the foundations for future research involving political scientists at the inception of the research design. While our study benefits from a costly measure of nonpartisanship, future work should take advantage of the familiar Likert scales of partisanship used throughout political science and seek to disentangle pure independents from those who lean

towards a party. Furthermore, future work should include measures of ideology to see if moderates are differentiable from nonpartisans.

Conclusion

In the present work, the nonpartisans' choice of identifying as No Party Preference excluded them from party primaries unless they requested a ballot and the party agreed to allow it. Notably, the Californian Republican, Green, and Peace and Freedom parties chose to hold closed primaries and refused to allow nonpartisans to obtain their primary ballot. Identifying as a nonpartisan can be a politically significant and costly act and if there are basic differences in social cognition underlying this act, then many of our analyses may be ignoring sources of heterogeneity in social identity construction that are particularly important during a time of significant political polarization. It may be that nonpartisanship can be just as expressive as partisanship (Huddy, Mason, and Aarøe 2015).

If activity in the right medial temporal pole, orbitofrontal/medial prefrontal cortex, or right ventrolateral prefrontal cortex function as neurocorrelates for differentiating nonpartisans from partisans, it might also point to opportunities for further theoretical advancements in understanding nonpartisanship as a social identity in itself. Nonpartisans discriminate against partisans (Smirnov et al. 2010), hold their nonpartisanship as important parts of their identity (Klar 2014), and their nonpartisanship appears to have a biologically heritable component (Settle, Dawes, and Fowler 2009). Just as the amygdala's role in processing threat and uncertainty more generally has converged with its role in political ideology (Jost and Amodio 2012), the roles these three regions play in processing social cognition may help us to illuminate our understanding of nonpartisans as dissimilar to partisans. The evidence from neuroimaging

here converges with the behavioral evidence to view nonpartisans as distinct in type, rather than merely in the degree of partisanship.

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