Neural Correlates of Political Ideology and Inhibition

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Brief Overview:
We contribute to new research in biological politics by exploring the role of inhibition in political ideology. Using survey data, a behavioral task, and electroencephalography, we examine inhibition in a stratified sample of liberals and conservatives. The first stage of our project is correlating measures of behavioral motivation with political ideology using survey data. We also describe an experiment designed to test for differences in sensitivity to inhibition and behavioral motivations.
Keywords: neuropolitics, self-regulation, inhibition, biopolitics, ideology

Abstract:
New research in political psychology increasingly suggests that political orientation may have a psychological and biological component. We seek to contribute to this research by exploring the role of inhibition in political orientation. Our project has two stages. First, we look for correlation between self-reported measures of political orientation and inhibitory behavioral motivation, using Gray’s theory of the Behavioral Inhibition System (BIS). Second, we propose a behavioral task to corroborate our survey findings and advance beyond self-reported measures. The Go/No-Go task habituates participants into a frequent “Go” response but then infrequently introduces an unpredictable “No-Go” signal, requiring participants to quickly inhibit the habituated “Go” response. We will record behavioral data as well as electroencephalography, which is a measure of electrical signals from the brain. Using a stratified sample of strong liberals, strong conservatives, and consistent moderates we expect to find behavioral and neurocognitive differences between these three groups during the Go/No-Go task. This study builds on Amodio, Jost, Master, and Yee (2007), but includes multiple measures of political orientations and uses a non-student sample.
One of the most fundamental questions that researchers in political behavior have endeavored to answer is, from where does our political orientation come from? Why do individuals have varying preferences for policy issues, and why do they disagree over how society should function? New research in political behavior reaches out to other disciplines to seek new insights into how internal factors may be related to the development of political attitudes. For example, interdisciplinary work in political psychology has reached out to social psychology, genetics, and neuroscience for new tools and new avenues of analysis for political science questions. The present study contributes to this large and growing project by examining how political orientation may be influenced in behavioral motivations of inhibition.

Our project unfolds in two stages. First, we examine correlations between psychological motivations for inhibition and political ideology using survey data. Our survey data demonstrates a modest correlation between self-reported behavioral inhibition and political liberalism, but it also suggests that alternative methods should be used to explore this correlation more fully. To more fully examine this question, we also plan to corroborate this survey data with an experiment. We plan to use the collected survey data to recruit 90 participants, stratified by ideological beliefs, for a neurocognitive study of behavioral motivation. This study will use the Go/No-Go task to collect scalp electroencephalography (EEG) data from the brain to test for differences in sensitivity to inhibition between political liberals, conservatives, and moderates. This paper outlines the background literature, our research questions, our research methods, and preliminary survey results. As data collection for stage two is ongoing, however, we do not report EEG data results. Our study contributes to existing literature by bringing attention to the role of inhibition and behavioral motivation in political ideology. We also replicate the
experiments of prior researchers in political neuroscience, while building on this research program by measuring ideology with multiple methods and by using a non-student sample.

**Literature Review**

**Psychological Motivations and Political Ideology**

There is a developing literature suggesting ties between psychological motivations and political ideology.\(^1\) Jost's theory of conservatism as motivated social cognition is a major contributor to this study. In an extensive meta-analytic review of 88 studies in 12 countries, Jost et al. (2003) found psychological motives underlie political ideology. In their review, they find evidence that political conservatives exhibit more death anxiety, are less tolerant of ambiguity, have less openness to new experiences, have less tolerance for uncertainty, have more need for order, structure, and closure, and have more fear of threat and loss when compared to political liberals. Jost et al. propose that political ideology is adopted in order to fulfill psychological needs that may arise as a consequence of these psychological variables.

Jost and colleagues are not alone in their study of the psychological underpinnings of political ideology. Other researchers have suggested that conservatives have an increased wariness of out-groups that may be related to heightened feelings of threat in certain contexts (see Skitka and Mullen 2002, 119; De St. Aubin 1996; Stone and Schaffner 1988). Right-wing authoritarianism has a long history of being correlated with and being activated by threat (Lavine

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\(^1\) By psychological motivations, we mean the myriad of cognitive, affective, or dispositional factors that have been shown to affect behavior. By political ideology, we mean the traditional understanding of the left-right divide in politics. For Jost and his colleagues, there are two core dimensions that divide liberals and conservatives (Jost et al. 2003, Jost et al. 2007). The first is attitudes toward inequality, with conservatives being more accepting and tolerant of inequality in human beings (including unequal rewards). Liberals view human beings as equal, and prefer egalitarian outcomes. The second dimension is attitudes toward social change versus tradition. Conservatives prefer tradition, order, and authority while liberals prefer changing societal structures aimed at improving the status quo. Defining political ideology is important, but not essential to the present study.
et al. 2002; Lavine et al. 2005). Nail and McGregor (2009) observed a movement towards conservative political stances in eight of eight items in two independent surveys of adults, one taken before 9/11 and one taken afterwards. Survey respondents reported increased support for conservatives, George W. Bush, and increasing military spending, and had less support for socialization of medicine. Weber and Federico (2007) found that anxious attachment styles were associated with right-wing authoritarianism and mediated by belief that the world was a dangerous place. They also found that avoidant attachment styles were associated with social dominance orientation. The perception of a dangerous world is correlated with right-wing ideologies (Jost et al. 2003), and it is especially strong among political sophisticates (Federico et al. 2009. Oxley et al. (2008) present evidence that conservatism is correlated with physiological reactions to non-political stimuli. In a group of non-student participants with strong political beliefs, individuals less tolerant of sudden noises and fearful/disgusting visual images, tended to support increased defense spending, capital punishment, patriotism, and the Iraq War.

It is clear from research that a large array of dispositions, traits, and psychological styles distinguishes conservatives from liberals. Research has established a connection between negative affective traits/states, as well as avoidance-based behavioral motivations. In this study, we are interested in the role of inhibition and behavioral motivation. Inhibition, which is one part of behavioral motivation, is the process of stopping behavior in response to cues of new information. The process of inhibition is important for virtually all behavior, and our dispositional styles of self-regulation may be related to the set of political attitudes that we find most appealing. Jost and Amodio (2012) review the current research and describe liberals as more open, more cognitively flexible, and more tolerant of ambiguity and uncertainty than conservatives, and these differences could be related to why liberals have a stronger inhibitory
response (as demonstrated in Amodio et. al 2007). Below we outline the dominant research strand for studying behavioral inhibition in social psychology.

**Inhibition in the BIS/BAS Behavioral Motivation Systems**

Gray’s dual behavioral motivation systems—the Behavioral Inhibition System (BIS) and the Behavioral Approach System (BAS)—are a pair of heuristic devices developed to help explain animal and human behavior. BIS can be thought of as a process for stopping when a potential threat or reward is detected, while BAS is a process for going forward to enact a plan of action (Demaree, Everhart, Youngstrom, & Harrison, 2005). Worded another way, BIS as an aversive system, while BAS is an appetitive system (Carver and White 1994).

BIS is thought to facilitate attention or sensitivity to cues of punishment, danger, avoidance, and novelty. Gray suggests that BIS functioning is responsible for feelings such as fear, anxiety, frustration, and sadness in response to cues (Carver and White 1994; Gray 1978, 1981, 1987, 1990). BIS functions to interrupt current behavior in order to process these cues of new information in preparation for a response. High BIS activation is associated with enhanced attention, arousal, vigilance, and anxiety, and very strong BIS corresponds to anxiety-related disorders (Fowles, 1988; Quay, 1988).

The complementary system to the BIS is the BAS, which represents a motivational system sensitive to signals of reward, nonpunishment, and escape from punishment. BAS facilitates approach towards a reward (going toward), but also facilitates active avoidance away from a punishment (going away) (Amodio et al. 2008). BAS has been associated with feelings of optimism, joy, aggression, and anger (Gable et al. 2000; Gray & McNaughton, 2000; Wingrove & Bond, 1998; Harmon-Jones 2003).

The BIS and BAS scales developed by Carver and White (1994) have been used extensively by psychologists to measure dispositions for behavioral approach and behavioral
inhibition, as well as emotion. BIS, in particular, is associated with inhibition (Amodio, et al. 2008) but has not been examined in the context of political ideology. Looking for correlations between sensitivity to inhibition and political ideology in self-reported measures is a first step, and below we outline methods from neuroscience that offer new avenues to study the role of inhibition, which can then be corroborated with the survey data.

**Neuroscience and Behavioral Inhibition**

Neuroscience has contributed in a significant way to the study of emotional affect and behavioral motivation. By borrowing some of these methodologies, we can find new tools to study how political ideology may be related to behavioral inhibition. Amodio et al. (2008) used a Go/No-Go task with EEG monitoring designed to measure the neurocorrelates of the behavioral inhibition system (BIS), and suggested that neural mechanisms for conflict monitoring in the anterior cingulate cortex (ACC) can be correlated with BIS. Thus, through using measures such as the Go/No-Go task with EEG monitoring and hemispheric asymmetry the neural underpinnings of BIS may be measurable without needing to rely purely on self-reported measures.

To date, three studies have explored the possible connection between behavioral motivational styles in the brain and political ideology. Amodio et al. (2007) hypothesized that differences in the cognitive styles of liberals and conservatives might reflect basic differences in information processing mechanisms, such as those involved in conflict monitoring—a neurocognitive process for detecting discrepancies between response tendencies and one’s higher-level intentions (Amodio et al. 2008). To test this prediction, Amodio et al. compared participants’ self-reported political orientation with behavior and neural activity on a Go/No-Go

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2 The Go-No Go task requires participants to make one response (e.g., a button press) on a dominant stimuli (e.g., the letter “M”), and withhold that response on a less frequent stimuli (e.g., the letter “W”).
task. Consistent with the model of political ideology as motivated social cognition, liberalism
was associated with greater behavioral accuracy on No-Go trials of the task. Furthermore,
liberals’ EEG signal exhibited significantly larger event-related potentials \(^3\) (ERP), indicative of
greater anterior cingulate cortex (ACC) response on No-Go trials than did conservatives,
supporting the hypothesis that political orientation may be linked to basic neurocognitive
processes for dealing with new and unexpected information.

Weissflog et al. (2010) also assessed ERP responses and political ideology, this time in a
sample of Canadian university students who completed the Go/No-Go task. As in the Amodio et
al. 2007 study, a stronger liberal orientation was associated with larger No-Go N2\(^4\) amplitudes,
indicating greater conflict-related ACC response, and thus replicating the results of Amodio et al.
(2007). In addition, larger No-Go N2 and Event-Related Negativity (ERN) amplitudes in these
college students were correlated with greater endorsement of egalitarian values and lesser
endorsement of right-wing authoritarianism.

Although they did not look at political attitudes or ideology directly, Inzlicht et al. (2009)
indicated that higher religiosity was correlated with smaller ERNs in response to errors on a
color-naming Stroop task (1937)\(^5\). As Jost and Amodio (2012) note, there is a strong association
between conservatism and increased religiosity, and so this study may also be considered broadly
consistent with the results of Amodio et al. (2007).

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\(^3\) Event-related potentials (ERP) are one way of analyzing scalp electroencephalography (EEG) data allowing for
comparison between different experimental conditions (see Luck, 2005).

\(^4\) Particular waveforms in the ERP are named variously in the literature. N refers to a negative going wave, P a
positive going wave. In this case N2 refers to the second negative going wave in a given ERP. Alternatively ERPs
are sometimes given names relating to their latency (N200) is the negative going wave approximately 200 ms after a
cognitive event (e.g., a stimulus or response), or are named based on what elicits them (e.g., Error related negativity
(ERN)).

\(^5\) The color-naming Stroop Task (1937) requires participants to name the color of the ink that a color word is written
in. Importantly, on some trials the ink color and the word written do not match (e.g., GREEN written in red ink),
causing a response conflict, because reading is believed to be an automatic cognitive process.
Research Questions and Hypotheses

Based on research by Jost and others, suggesting that liberals have a more cognitively flexible style, allowing them to respond quicker to new information and halt ongoing behavior, we propose that liberals should have higher scores on BIS self-report scales. Conservatives are expected to have more structured and persistent cognitive styles, which makes them react slower to new information in order to change behavior. This prediction follows Amodio et al. 2007 and is consistent with Jost’s theory of political ideology as motivated social cognition (Jost et al. 2003, Jost and Amodio 2012).

In summary, there are two general approaches we take to measure behavioral inhibition—a survey questionnaire with a battery of BIS questions and cognitive neuroscience methods. There are a number of issues with using survey measures to generate general proclivities for behavioral motivation, however, so we also propose using neurocognitive techniques to measure BIS. Amodio et al. 2008 outline one such tasks to measure the neural correlates of BIS in the brain, which allows researchers to avoid complications with self-reported survey items. The Go/No-Go behavioral task can be directly correlated with self-reported BIS survey measures. Our hypotheses are based on the literature summarized above:

<table>
<thead>
<tr>
<th>BIS and Political Ideology hypotheses</th>
</tr>
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<tbody>
<tr>
<td>H 1:  Liberals will have higher self-reported BIS in survey data.</td>
</tr>
<tr>
<td>H 2:  Liberals will have better accuracy in the Go/No-Go behavioral task*</td>
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<tr>
<td>H 3:  Liberals will have greater conflict-related ACC activity during the Go/No-Go Task.*</td>
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</tbody>
</table>

*data collection is still ongoing

Methods
Survey

Our research team sent 1144 emails to non-student adults employed by Loyola University Chicago, inviting them to take our survey on political attitudes and personality. We contacted every campus staff employee at Loyola who was working at the Lake Shore campus (the main campus near the northern border of Chicago) or the Water Tower campus (situated in downtown Chicago). We did not contact employees above the position of director nor did we contact any faculty. After an initial wave of email invites, we also sent a paper copy of the survey to 841 people who did not respond to the initial email. After a few weeks and follow-up messages, we received a total of 406 completed surveys (35.4% response rate). 251 of those who completed the survey also volunteered to be considered for our experiment in the second stage of this study. A stratified sample of ninety participants (30 liberals, 30 moderates, and 30 conservatives) will be recruited from our surveys to complete our computer tasks while recording electrical signals in the brain.

Questionnaire Design

To measure political orientation, we used three different question sets. Previous research in political neuroscience on these questions has relied on 11 point self-placement scales of political ideology (e.g. Amodio et al. 2007). While self-placement is fairly reliable, we propose using a mixed method that observes self-placement, attitudes on contemporary political issues, and attitudes towards bedrock ideological principles. These three measures are all recoded and scored to measure conservatism (a low value on the scales is more liberal, and a high value is more conservative).
Self-placement of Ideology. We use the standard seven-point ideology scale relied on by the American National Election Studies. Accurate self-placement on this scale requires that participants understand what the labels liberal and conservative mean, and it requires that they can place themselves on that continuum. Although self-placement is commonly used in political science and psychology literature, it has not gone unchallenged.

Attitudes on contemporary political issues. Political ideology is sometimes considered an aggregate of all the issue positions an individual holds. A person who takes many more conservative political positions than liberal ones is thought to be a political conservative. We use a variation of the Wilson-Patterson scale of political ideology (1968), which asks respondents to support or oppose a policy issue. Their decision on each policy indicated either a liberal or conservative opinion, and we can derive an aggregate measure of their conservative ideology by adding up the number of conservative answers they gave (a score of zero conservative answers would mean a person gave the liberal answer twenty times, and they would be classified as a liberal). The original Wilson-Patterson battery of the 1960s needs to be updated for the contemporary political environment, and so we adopted the modified Wilson-Patterson battery as updated by Smith et al. (2011).

Attitudes toward bedrock ideological principles. We also include the measure of bedrock political ideology developed by Smith et al. (2011), which is designed to tap into baseline values and preferences instead of specific public policy attitudes. The “Society Works Best” question battery is designed to tap into these bedrock principles of human society organization. These questions tap into values for how a society should function, and they center around resolving central dilemmas that arise human societies. These dilemmas include matters of leadership style, protection from outgroups, punishing rule-breakers, and establishing behavioral norms. Unlike attitudes on contemporary political issues, these bedrock principles are more abstract but are also
more timeless across the span of human experience. Smith et al. 2011 suggest that bedrock principles may be the most logical place to start an investigation of political ideology, given that “it is much easier to understand the evolutionary logic for ‘slates’ containing programmed reactions to ancient dangers than it is to understand the reason we might possess biological predispositions toward school prayer, foreign aid, federal housing, and capitalism” (Smith et al. 2011, 370).

Behavioral Inhibition Self-Report. To measure behavioral inhibition, we use Carver and White’s (1994) question battery. Carver and White propose a seven item question set to measure Gray’s Behavioral Inhibition System (BIS). This question set has been used hundreds of times in psychology research and is psychometrically validated (Jorm et al. 1998).

Preliminary results

Data collection from the electroencephalography study is still ongoing. Below, we present the results from our survey (n=406). First, do the three measures of ideology correlate? Yes, all ideology correlations are positive, statistically significant and larger than 0.50. Unsurprisingly, all three measures seem to tap into a common latent attitude structure related to political ideology. Party identification is also included in this table for comparison purposes, although we do not believe party identification is tapping into the same latent constructs as the measures of political orientation.
### Correlation Table: Measures of Ideology

<table>
<thead>
<tr>
<th></th>
<th>Self-Identified Ideology</th>
<th>Wilson-Patterson</th>
<th>Bedrock Principles</th>
<th>Party ID, with leaners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Identified Ideology</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wilson-Patterson</td>
<td>0.70*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Bedrock Principles</td>
<td>0.50*</td>
<td>0.63*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Party ID, with leaners</td>
<td>0.59*</td>
<td>0.58*</td>
<td>0.41*</td>
<td>-</td>
</tr>
</tbody>
</table>

* p < 0.01

**Sample characteristics.** Below are the frequency charts of the survey sample on the ideological variables. We can see that this sample is skewed heavily to the liberal side (x-axis ranges are drawn to represent the full possible range theoretically possible from each scale—blank space on the far rightmost area of the charts represents the lack of survey respondents who scored on the far rightmost side of the ideological scale.)
Distribution of Society Works Best (Bedrock Principles)

Party ID, with leaners
- Dem
- Ind
- Rep

Society Works Best (Bedrock Principles)
(lo=liberal, hi=conservative)
Behavioral Inhibition System and Political Ideology. We find a modest but significant positive correlation between political liberalism and self-reported sensitivity to behavioral inhibition, confirming hypothesis 1. More conservative participants indicated they had less self-reported behavioral inhibition sensitivity, while liberal participants indicated they had more sensitivity.
Correlation Table: Measures of Conservative Ideology and self-reported Behavioral Inhibition

<table>
<thead>
<tr>
<th></th>
<th>Self-Identified Ideology</th>
<th>Wilson-Patterson</th>
<th>Bedrock Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Inhibition</td>
<td>-0.19*</td>
<td>-0.23*</td>
<td>-0.14*</td>
</tr>
</tbody>
</table>

*p < 0.01

Note: negative correlations indicate negative relationship between ideology batteries and political conservatism.

Correlation between Ideology and BIS, with slight jittering
Correlation between Wilson-Patterson and BIS, with slight jittering

Party ID, with leaners

Dem □ Ind □ Rep

Wilson-Patterson (Issue Attitudes)
(lo=liberal, hi=conservative)
Correlation between Society Works Best and BIS, with slight jittering

Party ID, with leaners

BIS

Society Works Best (Bedrock Principles)
(lo=liberal, hi=conservative)
Discussion

We found modest, but reliable, negative correlations between self-reported BIS and various measures of political ideology, thus confirming hypothesis 1. Hypothesis 2 and 3 require the second stage of our project, and data collection is ongoing. Analysis of the survey results is ongoing and interesting findings may exist in specific survey response items or underlying political values. We may find, for example, that BIS is correlated with particular elements of liberal ideology, instead of the aggregate concept of “liberalism.” We have yet to look for sex or racial differences, which deserve an investigation as well. While we are not surprised that self-reported measures of BIS do not have large effects when correlated to political ideology, we do not believe these modest effects are the end of the story. Our experiment with the behavioral task will help shed more light on this correlation.

We will add a final short note about political ideology and inhibition. Inhibition or self-regulation has a natural connotation that may strike readers as intrinsically positive. A reader, for example, may think of self-regulation as a useful practice for human beings in social situations. Controlling impulses may seem like civilized behavior, and/or simply a wise way to interact with the world around you. However, we believe that the intrinsic value of self-regulation, like many other psychological dispositions, is dependent on the context. In many situations, self-regulation can certainly be seen as a good thing. Feelings of road rage in driving situations frequently move people towards violent thoughts about the transgressor, and yet, acting on that anger with aggressive behavior is always a bad idea. But in other situations, self-regulation can be negative. Too much self-regulation in certain circumstances may result in inactivity or standoffishness. Goals may not being accomplished, calculated risks may never being taken, or friendships and social connections may be more difficult to form. In any case, the
ability to self-regulate is a fundamental part of being a human being, and there is little question that both liberals and conservatives are capable of successfully self-regulating. We are interested in looking for patterns of difference between liberals and conservatives, but we should be wary of ascribing any judgment on a group that seems to have less (or more) inhibitory response.
APPENDIX

Wilson-Patterson Political Ideology Battery
A measure of issue positions (from Smith et al. 2011)

Do you oppose or support (issue)?

Issues:
Prayer in schools
Pornography being sold to adults
Strong penalties for illegal immigration
Women’s equality
Death penalty
Patriot Act
Biblical truth
Gay marriage
Legal abortions
Patriotism
War in Afghanistan
Welfare spending
More tax cuts
Increases in gun control
Increases in military spending
Police searches without warrants
Increases in pollution control
Small government
Foreign aid
Free trade

Bedrock Principles Scale
A measure of underlying political value preferences (from Smith et al. 2011)

1. ___ People live according to traditional values
   ___ People adjust their values to fit changing circumstances

2. ___ Expectations of how people should act are allowed to evolve over time
   ___ Expectations of how people should act are based on an unchanging code

3. ___ Our leaders stick to their beliefs regardless
   ___ Our leaders change positions when situations change

4. ___ People assume those in faraway places are mostly like us
   ___ People realize those in faraway places are mostly different from us
5. ___ We realize we need to take care of our own people first
   ___ We realize people everywhere deserve our help

6. ___ Those who break minor rules are forgiven
   ___ Those who break minor rules are punished

7. ___ More fortunate members contribute more
   ___ Every member contributes equally

8. ___ People are rewarded according to merit
   ___ People are rewarded according to need

9. ___ People join together to help others
   ___ People take responsibility for their own welfare

10. ___ People are proud they belong to the best society there is
    ___ People realize there are many ideal societies and no single best society

11. ___ Our leaders are mostly questioned
    ___ Our leaders are mostly obeyed

12. ___ Our leaders make the decisions
    ___ Our leaders are forced to listen to others

13. ___ People recognize that flaws of human nature can be positively changed
    ___ People recognize that flaws of human nature are unchangeable

14. ___ Our leaders compromise with their opponents in order to get things done
    ___ Our leaders adhere to their principles no matter what

**Question Scales for Behavioral Inhibition System**
(BIS, from Carver and White 1994)

Answer is a four point scale from 0 (Strongly Disagree) to 3 (Strongly Agree).

*BIS (Behavioral Inhibition System)*
1. Even if something bad is about to happen to me, I rarely experience fear or nervousness.*
2. Criticism or scolding hurts me quite a bit.
3. I feel pretty worried or upset when I think or know somebody is angry at me.
4. If I think something unpleasant is going to happen I usually get pretty "worked up."
5. I feel worried when I think I have done poorly at something important.
6. I have very few fears compared to my friends.*
7. I worry about making mistakes.

*Reverse Scored*
REFERENCES:


