

A Neurology of the Conservative-Liberal Dimension of Political Ideology

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Differences in political ideology are a major source of human disagreement and conflict. There is increasing evidence that neurobiological mechanisms mediate individual differences in political ideology through effects on a conservative-liberal axis. This review summarizes personality, evolutionary and genetic, cognitive, neuroimaging, and neurological studies of conservatism-liberalism and discusses how they might affect political ideology. What emerges from this highly variable literature is evidence for a normal right-sided "conservative-complex" involving structures sensitive to negativity bias, threat, disgust, and avoidance. This conservative-complex may be damaged with brain disease, sometimes leading to a pathological "liberal shift" or a reduced tendency to conservatism in political ideology. Although not deterministic, these findings recommend further research on politics and the brain.

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Political ideology divides people, societies, and nations, often with serious consequences. Although the word "politics" derives from the Greek word for relating to other citizens, in practice it is more about the power to influence the social and economic behavior of others. Political ideology, on the other hand, is the philosophy that guides this power or influence, and ranges from support for traditional values and the status quo to favoring change and an egalitarian society.¹ This range corresponds best to a conservative-liberal axis, and most people fall somewhere along its length, with relatively few individuals at the far extremes.^{1,2} Elucidating the underlying sources for extreme political ideology, such as variations on the conservative-liberal axis, is important for understanding the political differences that divide us.

There is increasing evidence that neurobiological factors mediate where people fall on a general conservative-liberal axis that involves social, cultural, religious, economic, and other domains, as well as political ideology. Many studies now indicate that differences between extreme conservatives and extreme liberals are not entirely due to differences in socioeconomic, cultural, or other learned attributes, or rational consideration of the issues.³ Conservatism-liberalism is also associated with differences in personality, attention, memory, perception, emotional reactions, problem-solving, and response choices.⁴ Although neurobiological mechanisms affecting conservatism-liberalism are not clearly deterministic, some investigators suggest an evolutionary protective origin, with some situations favoring more conservative orientations and others permitting more liberal ones.⁴

Further support for neurobiological mechanisms comes from clinical observations of patients with acquired brain disease. Neurological disorders that affect socioemotional areas of the frontal lobes and adjacent regions can change where one falls on the conservative-liberal spectrum, primarily toward the liberal.⁵ Neurologists and psychiatrists have not considered the underlying neurobiological mechanisms for these changes in light of current knowledge of conservative versus liberal differences. These patients, and the current behavioral neuroscience literature, offer the opportunity to synthesize a formulation of the underlying neurobiological structures and mechanisms associated with conservatism-liberalism and how this affects political ideology.

The present review summarizes the pertinent scientific literature on the conservative-liberal axis with a focus on studies that assess this axis in the political domain. This review covers five research areas: 1) personality differences, 2) evolutionary and genetic information, 3) cognitive and psychophysiological processes, 4) neuroimaging studies, and 5) brain disease. This literature has a number of important qualifications. First, the majority of these studies have determined conservatism or liberalism based on self-reports, inventories, or a focus on extremes of the conservative-liberal spectrum. Second, many of the behavioral studies involve small numbers of subjects and the presence of difficult to control confounding variables. Third, conservatism-liberalism has a critical influence on political ideology, but it is not the only determinant, and individuals can fall on different parts of this axis, depending on the domain involved. Finally, and most importantly, any conclusions about

TABLE 1. Reported Brain and Behavior Affiliations for General Conservative Versus Liberal Orientation With Implications for Political Ideology^a

Brain and Behavior Affiliations	High Conservatism	High Liberalism
Personality	Stability; opposition to change Conformity Tradition Order, structure, and closure Favor less complexity; harder categorization Purity Authority Conscientiousness Distinctions with out-groups Expressions of power	Novelty Unconventional; self-expression New experiences and sensations Flexibility and variability Tolerance for uncertainty and ambiguity Minimization of harm Equality Empathy Universal community Expressions of warmth
Cognitive	Negativity bias Greater sensitivity to threat or loss	No clear bias Greater sensitivity to cues for altering habitual response patterns
Physiological	Sensitivity to disgust Greater activation of right amygdala	Greater conflict-related anterior cingulate cortex activity
Neuroimaging	Increased gray matter volume in right amygdala and other right anterior structures	Increased gray matter volume in anterior cingulate cortex

^a References and studies for cognitive, physiological, and neuroimaging discussed in the article text.

neurobiology derived from this literature must be placed in the context of the overwhelming influence of life experience, including the fact that people change their political beliefs and that political beliefs vary with geography, occupation, and other factors. Moreover, most individuals manifest both conservative and liberal tendencies, often varying with context and domain. With these qualifications, there is emerging evidence for a specific neurobiological circuitry that involves a right-sided anterior brain “conservative-complex” for preservation of the status quo and anterior cingulate cortex (ACC) and left prefrontal cortex (PFC) roles in responding to change and promoting approach.

PART 1: PERSONALITY TRENDS

Psychologists and others have long speculated about an association of personality types or traits and political ideology. An early formal theory of such an association emerged in the 1930s, when the German perception psychologist, Erich Jaensch, proposed a theory of personality derived from generalization of someone’s perceptual “purity,” or the ability to integrate sensory phenomena into a single dynamic whole.⁶ His “li-type” (inwardly integrated) personality displayed integrity regarding societal goals, was conservative, group-oriented, and unambiguous in judgments, and prevailed among Nazis. In contrast, his “S-type” (synesthesia) was lax in mixing of the senses, tended to be liberal, imprecise, and individualistic, and prevailed among communists, Parisians, and Jews. Among personality theories developed subsequent to World War II, the literature is most supportive for a relationship between conservatism-liberalism and the personality traits of the five-factor model (“big five” of openness, conscientiousness, extroversion, agreeableness, neuroticism).⁷ Despite significant variations from country to country, studies point to an association

between conscientiousness traits among people with politically conservative values and openness to new experiences among those with politically liberal values.^{2,8}

The emphasis on conscientiousness and openness is evident in other reported personality differences (see Table 1).^{1,9} On personality, self-report, and other behavioral measures, high political conservatism is associated with preferences for stability, conformity, tradition, and order and structure.^{1,2,10,11} High political liberalism, in contrast, is associated with preferences for creativity, curiosity, novelty-seeking, and new experiences.^{1,2,10,11} Highly politically conservative people eschew ambiguity and disorganization and prefer closure and limited shades of gray (“hard categorizers”).^{1,2,10,11} Highly politically liberal people tolerate ambiguity and disorganization and favor flexibility and taking on cognitive conflicts.^{1,2,10-12} A proposed example is preference in art; political conservatives often prefer traditional art, whereas political liberals are often more interested in abstract art.¹³ Carney et al.² even found greater orderliness among political conservatives compared with political liberals in their personal and office spaces.² Moreover, when evaluating faces, perceivers may distinguish political conservatives from political liberals, judging conservatives as more powerful and liberals as warmer.¹⁴

There are a few other results from personality studies with significant implications for political ideology. First, personality evaluations using measures other than the big five tend to show similar differences for the conscientiousness-openness distinction, such as more security and conformity with political conservatism and more universalism and self-direction with political liberalism.¹⁵ Second, in comparison to political liberals, political conservatives are more cautious in exploring novel situations, and they experience ambiguous facial expressions as more threatening,¹⁶ suggesting a greater focus on self-protection from negative outcomes.¹⁷ Third, among political conservatives compared with political liberals,

negative stimuli or information leads to greater avoidance behavior.^{18–20} For example, when required to make computerized movements, political conservatives compared with political liberals have trajectories with greater avoidance of negative stimuli.²¹ Avoidance of negative stimuli may be the reason that political conservatives score lower on openness to experience and higher on conscientiousness while conforming more to social norms.²² Fourth, political conservatives, compared with political liberals, may be more likely to attribute negative behavior to a person's internal motivations, as compared with external factors.^{23,24} Finally, changes in personality over time do not predict changes in political attitudes, suggesting that political ideology is not entirely dependent on personality traits.²⁵

Not surprisingly, these personality studies verify a distinction between conservative conscientiousness for tradition and for the prevailing order, compared with liberal openness to novelty, ambiguity, and change. In the political arena, these traits coincide with conservative-liberal voting and other political activities. This distinction also coincides with evidence for neurobiological differences in conservatism-liberalism from evolutionary theory, cognitive and physiological studies, and neuroimaging.

PART 2: EVOLUTION AND GENETICS

Evolutionary psychologists stress that politics and alliances are necessary in order to influence one's position in social groups and the direction of one's group⁴ and have proposed the parasite-stress theory as a major driving force for the evolution of conservatism-liberalism.^{26,27} The parasite-stress theory views people as having inherited parasitically modified behavioral tendencies aimed at avoiding those who bring the greatest risk of infection and transmitted disease to one's social group. Those who do not conform to in-group norms and members of outgroups with unfamiliar cultures and behaviors bring the greatest risk of infection and are avoided the most. In other words, parasitic stress may promote in-group collectivism or "groupishness" and group social norms,^{28–30} as well as conservative social and sexual attitudes and distrust of strangers,^{26,30–32} all of which defend against the effects of parasites.³²

This "behavioral immune system" works through a basic instinct to avoid contamination via the experience of disgust from disease-laden cues and people who may harbor infectious agents.^{30,33} In comparing political conservatives with political liberals, investigators report greater disgust sensitivity, especially for contamination disgust and violations of the sense of purity,^{34–37} and greater functional MRI (fMRI) responses to images with a disgusting theme, such as mutilated bodies.³⁸ Just showing people disease-related images can lead to increasing feelings of avoidance,³⁹ and inducing disgust with disgusting images or sensations can both boost the physiological immune response and increase prejudice to outgroups.^{26,33,40} Inducing disgust can

heighten the sense of moral violations and shift moral judgments to the conservative side.⁴¹

Social psychologists have also proposed the moral foundation theory as a source of an evolutionary derived basis for moral behavior, with consequences for general conservatism-liberalism.⁴² This theory posits that moral instincts evolved to generate rapid, intuitive moral judgments, such as care/harm, fairness/cheating, loyalty/betrayal, authority/subversion, and purity/disgust.⁴² Those who are very conservative emphasize loyalty to the in-group, submission to authority, and a sense of purity, whereas those who are very liberal emphasize minimizing harm to others and maximizing fairness.⁴³ There are challenges to the moral foundation theory, however, including that it is overly dismissive of conscious deliberation and that these intuitions may not be heritable, stable over time, or predictive of subsequent changes in political ideology.⁴⁴

Although most political orientation is not directly inherited, twin studies and the dopamine D4 receptor (*DRD4*) gene have linked personality traits and evolutionary intuitions with political ideology.^{45–47} In a sample of more than 12,000 twin pairs, the development of political attitude was about 40% dependent on genes,⁴⁷ and, in another large twin study, the heritability of political conservatism was 64.5% for men and 44.7% for women.⁴⁸ A few studies have reported an association between specific genes and conservative-liberal behavior or with political attitudes.^{45,49–52} Genes encoding certain receptors to dopamine, specifically the *DRD4* gene on chromosome 11, were associated with variations in conservative-liberal personality traits.^{53,54} Two large studies have linked variations in the *DRD4* exon III tandem repeats to political ideology putatively based on the sensitivity to dopamine uptake and the need for higher dopamine.^{49,53} Among 1,771 students in Singapore, those with two copies of the 4-repeat allele on the *DRD4* gene were more politically conservative,⁵³ and among another group of 1,941 individuals, those with 7R+tandem repeats, in the context of having more friends, were more politically liberal.⁴⁹

These two theories from evolutionary psychology, the parasite-stress theory and the moral foundation theory, plus the limited genetic studies, converge in their deductions. The parasite-stress theory concludes that there are relationships between increased conservative social and sexual attitudes, reminders of cleanliness, and increased physiological responses to disgusting images.^{37,55} The moral foundation theory concludes that people with strong conservative views are most sensitive to violation of sexual and body purity, and those with more liberal views are sensitive to violation of harm or fairness.⁵⁶ Together with the genetic evidence, these findings support an underlying neurobiological basis for conservative-liberalism effects on political ideology.

PART 3: COGNITIVE AND PHYSIOLOGICAL STUDIES

Personality differences and evolutionary theories may be reflected in how individuals respond, cognitively and

physiologically, to environmental stimuli. In general, the further one is on the conservative spectrum, the more likely one is to respond to negative aspects of environmental stimuli, as opposed to positive aspects.^{22-24,57} This “negativity bias” is evident in studies showing that negative images shown to political conservatives, compared with political liberals, results in a greater, faster, and longer attentional focus on the images and greater physiological measures of arousal to them, as well as a stronger tendency to avoid them.^{55,58} For example, on presentations of valenced words on an emotional Stroop task, people with politically conservative views respond more slowly to negative words, suggesting that negative information automatically captures their attention.⁵⁸ On a dot-probe task, political conservatives are more likely to direct their attention toward spatial locations where the negative information was presented.⁵⁸ Physiologically, political conservatives, compared with political liberals, tend to have increased skin conductance responses to negative or aversive aspects of the environment.^{55,58,59} On eye-tracking of negative images, political conservatives, compared with political liberals, are faster to fixate on them, spend more time gazing at them, and have a stronger tendency to move away from them.^{55,60} Although multiple memory systems are involved in political decision making,⁶¹ political conservatism is also specifically correlated with negativity bias in remembering more negative than positive information or scenes.^{57,62}

In addition to negativity bias, high conservatism is associated with a sense of threat or a perception of danger.^{1,10} Those with politically conservative versus politically liberal views perceive ambiguous faces as more threatening,¹⁶ respond to threatening stimuli with more aggression,¹ and have greater blink startle responses and skin conduction responses to unexpected or potentially threatening images.⁵⁹ On behavioral and eye-movement responses during a visual search task for happy and angry faces, political conservatism correlated with speeded detection of angry versus happy faces suggesting speeded response selection to the perception of threat.⁶³ In a related study of websites and speeches, political conservatives tended to reference the known past, whereas strong liberals considered the uncertain and potentially more threatening future.⁶⁴

There are conservative-liberal differences in language use and visual perception that specifically support the distinction between in-group conformity and individualistic novelty-seeking. In a novel study of language use among partisan Twitter followers, those following Republicans, presumed the more politically conservative, use more words emphasizing group membership (in-group identity, national identity, religion), first person plural pronouns, tentative words, and references to achievement, government, law, and opponents.⁶⁵ Those following Democrats, presumed the more liberal, use more emotional words (feeling related, anxiety-related, positive emotions, expletives) and first-person singular pronouns, as well as references to uniqueness, culture, and entertainment.⁶⁵ The most differentiating

word, however, is the greater use of the article “the” among conservatives, possibly suggesting a greater emphasis on authority or formality (e.g., “the” Methodists or “the” African Americans). On visual perceptual tasks based on Navon-like figures and the Ebbinghaus illusion, political conservatives show greater perceptual constancy and context-dependency and display more global shape perception, whereas political liberals are more context-independent and aware of perceptual details.¹¹

In thinking styles, too, there are notable conservative-liberal differences. Conservatives tend to use “gut-reaction” heuristics and more step-by-step methodical analyses, whereas liberals tend to be more reflective (e.g., on the Cognitive Reflection Test) and prone to sudden insight solutions.⁶⁶ Paradoxically, political conservatives seem to rely both on rapid intuition and on an inflexible, systematic analysis that can lead to errors of commission when the task demands change.^{12,67} For example, in an evoked-related potentials (ERP) study using the Go-No-Go task, political conservatives more than liberals persisted in making the usual expected responses in No-Go trials, which signal that responses should change.¹² In contrast, during these same No-Go trials, the political liberals had larger ERP-related ACC activity, which signals that stimulus patterns are changing and may require a corresponding change in responses.¹² Among political liberals, these findings point to a greater sensitivity to changing one’s usual pattern of responses.^{12,68} In a meta-analysis of over 22,000 participants, political liberals had a preference for deep thought and a rejection of simple solutions.¹ Parenthetically, in a study of social conservatism-liberalism, liberals were less field dependent with more independent contemplation than conservatives.²⁹

In summary, among political conservatives, the cognitive and physiological studies demonstrate greater negativity bias, sense of threat, and emphasis on formal group membership, compared with political liberals exposed to the same stimuli. These findings, along with differences in thinking styles, are the basis of a “conservative complex,” as suggested by personality studies and evolutionary psychological theories.

PART 4: NEUROIMAGING STUDIES

Neuroimaging studies suggest that political ideology involves conservative-liberal differences in the amygdala, insula, and ACC.^{4,69,70} Just being interested in politics has increased activity in the amygdala and the ventral striatum,⁷¹ and encoding party preference activates bilateral insula and the ACC.⁶⁹ An MRI study of 90 young adults shows that political conservatives, compared with political liberals, have greater gray matter in the right amygdala,⁷² and an fMRI study involving a risk-taking task shows that political conservatives have greater activity in the right amygdala.⁷³ The association of political conservatism with the right amygdala,⁷² a structure that is bilaterally sensitive to

emotional saliency, especially fear, suggests an increased processing of potential signals for threat.⁷⁴ Although the anterior insula has a prominent role in the experience of disgust, brain responses to disgusting stimuli may show a more distributed pattern of differences between political conservatism and liberalism,³⁸ consistent with a differential sensitivity for disgust among political conservatives. The unexpected association of political liberalism with activity in the left posterior insula in one study may reflex an additional role of the insula in the expression of interpersonal trust.⁷⁵ Finally, political liberals have greater gray matter and increased ERP activity in the ACC,^{12,72,73} consistent with a sensitivity for processing signals for potential change.

Several areas of the prefrontal cortex (PFC) are additionally implicated in political ideology. The inferior frontal gyrus, particularly on the right, may be directly involved in risk aversion.⁷⁶ Activity in the ventromedial prefrontal cortex (VMPFC), which has a role in emotionally based experiences that are “positive” or “negative”^{5,77}, increases when just thinking about political issues,⁷⁸ and there is both VMPFC and dorsolateral prefrontal cortex (DMPFC) activity when taking the perspective of one’s own political candidate.⁷⁹ The DMPFC further participates when there is need for emotional regulation about politics, such as when focusing on opposing politicians or their faces, processing implicit measures of party membership bias, or associating one’s own candidate with unpleasant words.^{70,80}

Although not consistent, the right DLPFC may have a greater role in resolving good versus bad biases, partisan differences, or conflicts between fairness and self-interest,^{81,82} and, in one fMRI study, there was a clear association of right DLPFC activation with political conservatism.⁸³ Another fMRI study of depressed patients showed left rather than right DLPFC activation with heightened preferential processing of negative information,⁸⁴ and a positron emission tomography study showed left middle frontal gyrus (DLPFC) activation during a negativity bias condition.⁷⁷ Finally, non-invasive stimulation of bilateral DLPFC during the incorporation of political campaign information has resulted in a significant increase in politically conservative values,⁸⁵ and transcranial magnetic stimulation of the right, but not left, DLPFC has reduced the rejection of unfair offers when they are in conflict with self-interest.⁸⁶ Ultimately, the right DLPFC may have a greater role in mediating emotion-based conflicts and may interact with the right VLPFC, amygdala, and anterior insula in forming the neuroanatomical substrates of a conservative complex.

PART 5: EVIDENCE FROM BRAIN DISEASE

Brain disease can alter political orientation and other enduring self-concepts and, thereby, offers another window to the neurobiological circuitry of political ideology. Although publications in this area are sparse, one recent report of 134 participants with a history of penetrating TBI directly assessed the effects of the TBI on several political dimensions.⁸⁷

Political conservatism-liberalism was not changed as much as a decrease in “radicalism,” or the degree to which political statements deviate from those of the average population, in association with bilateral lesions of the VMPFC.⁸⁷ In another study of bilateral damage to the VMPFC, behavioral scales administered to 10 patients showed increased levels of submissiveness to authority and religious fundamentalism and beliefs.⁸⁸ Finally, in a study of voting decisions among seven patients with adjacent lateral orbitofrontal cortex lesions, their political decision making relied more on first impressions of physical attractiveness rather than on perceived competence.⁸⁹ In summary, these findings indicate that damage to the VMPFC and adjacent areas may alter political decision making, and specific VMPFC damage decreases the emotional valence of experience and shifts political judgments to more “rule-based” as opposed to emotional decisions.⁹⁰

The prototypical disease that alters personality and may alter political ideology is behavioral variant frontotemporal dementia (bvFTD). This disease presents with combinations of disinhibition, apathy or abulia, loss of empathy, stereotypical behaviors, dietary behavioral changes, and dysexecutive features.⁹¹ These patients have the foci of their disease in the ACC, VMPFC, anterior insula, adjacent anterior temporal lobe that includes amygdala, and the corresponding salience network.⁹² Investigators have described some bvFTD patients with right-sided predominant disease as capable of easily changing their self-concepts.⁵ For example, Miller et al.⁵ reported a 63-year-old previously conservative woman with bvFTD who became “politically opinionated” about her political preferences and also had outspoken anticonservative views to the point of confronting strangers. Her dress became more causal and frumpy; she developed an interest in animal rights; and she altered her preference for collecting crystal and jewelry to collecting stuffed animals.

It is only the patients with bvFTD who have asymmetric right frontotemporal involvement who may have alterations in political ideology, religion, or preferences in dress and hobbies.⁵ In bvFTD, asymmetric right-sided involvement is associated with a general decrease in the appreciation of negativity-threat-disgust.^{93–96} Patients with bvFTD have a particular reduced emotional evaluation of negative scenes, but not of positive or neutral ones⁹³; hence they have a reduced negativity bias. Patients with bvFTD also have reduced attention to aversive threat,⁹⁴ and they have decreased reactivity to disgusting stimuli.⁹⁵ Right frontal damage in bvFTD can also impair the drive for self-protective avoidance.⁹⁶ These reports of patients with bvFTD and other brain diseases lend support to the concept that right-sided frontotemporal disease results in either shift to liberal behavior or a reduced tendency to conservatism.

DISCUSSION

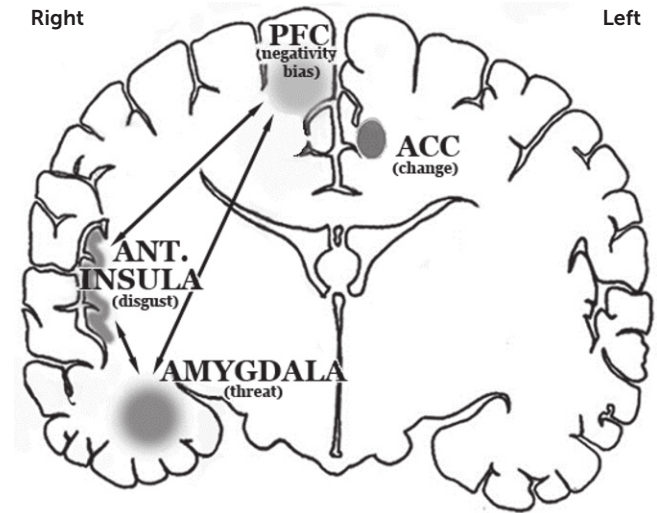
The literature on political ideology indicates a neurobiological circuitry for mediating the conservative-liberal dimension of

political ideology.³ This literature, although variable and often flawed, suggests the existence of a “conservative complex” in the right anterior brain (see Figure 1). Recognizing that there is a neurobiological basis for conservatism-liberalism does not mean that life experiences and social learning are not major determinants, or that the neurobiological underpinnings determine, rather than reflect, conservative versus liberal attitudes. Nevertheless, neurologists and psychiatrists have recognized patients with right frontotemporal brain disorders resulting in changes in conservative-liberal behavior with consequences for political ideology.⁵

Psychological studies document differences between highly politically conservative and highly politically liberal participants. Political conservatives compared with liberals favor in-group conformity and out-group exclusion consistent with evolutionary behaviors for pathogen avoidance.⁴⁰ Beyond differences in personality traits⁹ (see Table 1), the literature emphasizes differences in sensitivity and reactivity to negative stimuli, threat, and disgust between those on the extremes of a political conservative-liberal axis. Political conservatives, compared with political liberals, are more likely to interpret, attend to, remember, and respond to negative aspects of environmental stimuli, especially if they are novel and different.²² This “negativity bias” is evident in studies showing that political conservatism compared with liberalism is associated with greater, faster, and longer attentional focusing on negative images and greater physiological measures of arousal to them.^{55,59} Political conservatives compared with political liberals have a greater sense of threat from the same stimuli and show larger physiological responses to ambiguous stimuli.^{1,10,16,59} Political conservatives compared with political liberals are also more prone to respond with disgust to various situations, particularly if they violate a sense of purity.^{35,37}

Neuroimaging studies point to structures involved in a “conservative complex” primarily in the right frontotemporal region of the brain. In a structural MRI study, those with political conservative views versus those with political liberal views had greater gray matter in the right amygdala,⁷² a structure sensitive to fear and threat. Another fMRI study showed that political conservatives had greater activity in the right amygdala when risk-taking.⁷³ Although prior fMRI studies have not found lateralization of emotional face-processing, including fearful faces, to the right amygdala,^{97,98} recent human and animal studies suggest a more nuanced lateralization of low intensity, rapid, automatic, and explicit recognition of fear and threat to the right amygdala with more delayed and detailed processing on the left.^{98–103} The anterior insula may be involved in generating disgust, and the right ventrolateral PFC participates in overall self-restraint.¹⁰⁴ Finally, frontal structures and their amygdalar and other connections participate in an approach-avoidance dichotomy where left-sided activation results in approach to appetitive stimuli and right-sided activation results in withdrawal from aversive stimuli and avoidance of risk taking.^{18–20,98,105–107} Together, these right-sided structures

FIGURE 1. Schematic Diagram of the Conservative Complex on the Right, More Active in Conservatives Than in Liberals, and the Anterior Cingulate Cortex (ACC), More Active in Liberals Than Conservatives^a



Conservative Complex

^a Various regions of the prefrontal cortex (PFC) contribute to political thought and ideology, including the ventromedial prefrontal cortex (VMPFC), dorsomedial prefrontal cortex (DMPFC), and dorsolateral prefrontal cortex (DLPFC). Laterality is not as established for the PFC contribution, but at least for the DLPFC suggests greater right than left involvement.

appear to mediate conservative behavior, including political conservatism, and constitute a brake on change, maintaining stability, and protecting the status quo.

In addition to this “conservative complex,” there must be an “energization” or motivation for alternative action. The origin of this energization may be a preserved ACC, possibly lateralized to the left and consistent with the left hemisphere’s propensity for “approach” behavior.^{19,20,97,108,109} The ACC monitors changes in stimulus patterns and potential conflicts or ambiguity and redirects attention for resolving conflict and choosing new actions.^{110,111} In brain disease, a change toward liberal behavior requires not only an attenuation of the conservative complex brake, but also the ACC responding to stimuli with a choice for change.

There are many limitations to this literature and discussion of conservative-liberal effects on political ideology and the brain. First, there are reservations regarding the generalization of these findings, particularly given studies with small numbers or difficult-to-control confounding variables. Conservatism-liberalism is only one factor, albeit an important one, in determining political ideology. Individuals vary greatly, if not primarily, on how conservative or liberal they are, depending on the specific social or economic issue and the cultural or social context. All people are both conservative and liberal across different domains and to varying degrees, contexts, and times in their life, and they can change their political ideology. Furthermore, many of the studies presented here have involved participants on the extreme ends of the political conservative-liberal spectrum.

Second, investigators often use self-report to determine political ideology. This further limits the conclusions, as individuals' true political ideology may not entirely correspond with their self-perception or self-description to others. Third, these findings do not indicate an endorsement of any political ideology. Conservative and liberal behavior each has advantages for individuals and society. Some situations profit more from conservatism and others from liberalism. Finally, the presentation of a neurobiology of conservatism-liberalism does not indicate a deterministic outcome. Differences in local brain activity or anatomy could be the result, not the cause, of a developmental process with social determinants or may primarily function as propensities subject to environment and learning.

In conclusion, the literature points to a conservative complex involving negativity bias, threat, disgust, and avoidance. On studies of political conservatism-liberalism, those with stronger politically conservative tendencies, compared with those with more politically liberal orientations, have more psychological and physiological reactivity to negative stimuli, accompanied by a greater sense of threat, sensitivity to disgust, and tendency to avoidance. This conservative complex involves a right-sided anterior brain network that includes the amygdala, the anterior insula, and areas of the PFC. A change in conservative-liberal orientation away from conservatism and toward liberalism in neurological disorders may require attenuation of this conservative complex, with ongoing ACC activation for change. These conclusions from the current literature require verification with rigorous prospective research on politics and the brain.

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