

# Political ideology as motivated social cognition: Behavioral and neuroscientific evidence

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**Abstract** Ideology is a potent motivational force; human beings are capable of committing atrocities (as well as acts of generosity and courage) and sacrificing even their own lives for the sake of abstract belief systems. In this article, we summarize the major tenets of a model of political ideology as motivated social cognition (Jost et al. in *Psychol Bull* 129:339–375, 2003a, *Psychol Bull* 129:389–393, 2003b, *Person Soc Psychol Bull* 33:989–1007, 2007), focusing on epistemic, existential, and relational motives and their implications for left-right (or liberal-conservative) political orientation. We review behavioral evidence indicating that chronically and temporarily activated needs to reduce uncertainty, ambiguity, threat, and disgust are positively associated with conservatism (or negatively associated with liberalism). Studies from neuroscience and genetics suggest that right- (vs. left-) wing orientation is associated with greater neural sensitivity to threat and larger amygdala volume, as well as less sensitivity to response conflict and smaller anterior cingulate volume. These findings and others provide converging evidence for Jost and colleagues' model of ideology as motivated social cognition and, more broadly, reflect the utility of an integrative *political neuroscience* approach to understanding the basic cognitive, neural, and motivational processes that give rise to ideological activity.

**Keywords** Political · Ideology · Neuroscience · Brain · Motivation · Social cognition · Conflict · Genetics · ERP

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## Introduction

Even a cursory glance at history should convince one that individual crimes committed for selfish motives play a quite insignificant part in the human tragedy, compared to the numbers massacred in unselfish loyalty to one's tribe, nation, dynasty, church, or political ideology.  
(Arthur Koestler 1978, p. 14)

From a psychological point of view, the pervasiveness and potency of political and religious belief systems, or *ideologies*, highlights a fundamental conundrum about human motivation: How is it that individuals and groups can be so strongly inspired by an abstract configuration of ideas that they are willing to sacrifice even their own lives so that the ideas themselves can live on? As Koestler (1978) observed, people can be moved to commit atrocities (and also, presumably, remarkable feats of courage and generosity) because of socially shared beliefs, opinions, and values. Human beings, in other words, are ideological animals (Jost et al. 2004b). In this article, we seek to integrate theory and research from social cognition and neuroscience that illuminates the motivational potency of political ideology, so that we can better understand the ideological animal.

## The motivational underpinnings of ideology

What is it about ideologies that motivates us? Why are we prone to their far-reaching effects? Where does our species' uncanny enthusiasm for abstract belief systems come from? Psychologists often point to the uncertainty-reducing function of ideology in seeking to explain its motivational potency (e.g., Dember 1991; McGregor and Marigold 2003). For instance, Hogg (2007) has argued that ideologies

“arise under uncertainty and prevail to ward off uncertainty” (p. 103) and that this explains the “zealotry and the cult of the ‘true believer’ in the thrall of ideology” (p. 69).

Ideology is also motivating because it confers existential security, as emphasized in the writings of Becker (1975) and terror management theorists (Greenberg et al. 1986). The purpose of ideology, according to this view, is to cope with anxiety concerning one’s own mortality through denial, rationalization, and other defense mechanisms. Presumably, people are also drawn to socially shared belief systems for reasons of affiliation, as suggested by social identity (Tajfel and Turner 1979) and shared reality (Hardin and Higgins 1996) theories, among others. It has been suggested, for example, that “religion is a fraternity,” insofar as it “brings people together, giving them an edge over those who lack this social glue” (Bloom 2005).

In an effort to integrate these perspectives, Jost et al. (2009) proposed that ideology possesses motivational structure and potency because it serves underlying epistemic, existential, and relational needs. In other words, political and religious ideologies offer *certainty*, *security*, and *solidarity*. This does not mean, however, that all ideologies are the same or that they satisfy these needs equivalently or interchangeably. There are important psychological and, as it turns out, neurological differences that are associated with the holding of liberal (or leftist) and conservative (or rightist) ideologies (e.g., Jost et al. 2003a, b, 2007).

### The left–right (or liberal–conservative) dimension

Long before the French Revolution, when “left” and “right” became potent ideological labels, Christian symbolism associated the right (through handedness and other metaphors) with “liking for or acceptance of social and religious hierarchies” and the left with the “equalization of conditions through the challenge of God and prince” (LaPonce 1981, p. 135). Remarkably, this fundamental distinction, when applied to the political sphere, has retained impressive (but by no means perfect) stability for over two centuries (Bobbio 1996; Jost 2006, 2009). LaPonce (1981) noted that, if one removes references to the monarchy, the ideological language of the French Revolution provides an apt description of contemporary politics in Europe and North America: “Attachment to one’s privileges and to the hierarchical order is on the right; the desire to bring order down is on the left. The existing hierarchical structure, whether it be that of politics or that of the church, promotes security on the right, but oppresses on the left” (p. 51).

Jost et al. (2003a, b) drew on these and other historical and philosophical sources to propose that there are two

core, relatively enduring dimensions that separate left from right, or, in the US, liberalism from conservatism: (a) advocating versus resisting social change (as opposed to tradition), and (b) rejecting versus accepting inequality (see also Jost 2006, 2009; Jost et al. 2008). Jost et al. (2003a, b) also suggested that these two dimensions are typically correlated because Western civilization has been drifting, over a period of many centuries, in the direction of increasing social, political, and economic equality; thus, resistance to change has generally entailed a defense of inequality. In some cases equality increased gradually, and in other cases it occurred because of radical or revolutionary movements, which were opposed by conservatives (Burke 1790/1987; Hirschman 1991; Lipset and Raab 1978). Thus, it is reasonable to suggest, as Tomkins (1965) did, that the left–right difference primarily juxtaposes “the conservative emphasis on tradition and conformity and the progressive’s emphasis on change in the interests of the people” (pp. 23–24).

At first blush, it might appear that these matters of political philosophy are too broad, esoteric, and intangible to surrender themselves to empirical inquiry in psychology and neuroscience. Increasingly, however, political psychologists have argued that it is within our grasp to explain—at least partially and probabilistically—how and why certain individuals and groups gravitate toward liberal or progressive beliefs, opinions, and values, whereas others gravitate toward those that are conservative or reactionary (see Jost et al. 2009, for a review). In this article, we focus on recent evidence bearing on one such theoretical attempt to understand the motivational basis of political orientation, namely Jost et al.’s (2003a, b) model of political ideology as motivated social cognition.

### A model of political ideology as motivated social cognition

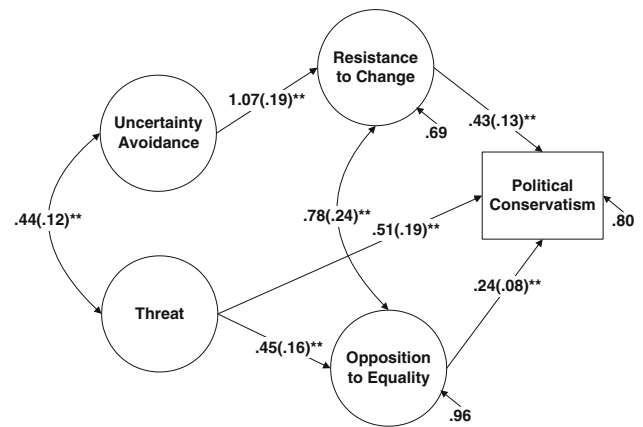
As noted above, Jost et al. (2003a, b) proposed that two core dimensions distinguish liberalism and conservatism: (a) advocating versus resisting social change (as opposed to tradition), and (b) rejecting versus accepting inequality. Individual preferences with respect to these two dimensions are theorized to emanate from basic psychological orientations toward uncertainty, threat, and conformity (i.e., epistemic, existential, and relational motives). The model as a whole was derived, at least in part, by synthesizing the pioneering research programs of Adorno et al. (1950), Rokeach (1960), Tomkins (1963), and especially Wilson (1973), who wrote that, “The common basis for all of the various components of the conservative attitude syndrome is a *generalized susceptibility to experiencing threat or anxiety in the face of uncertainty*” (p. 259,

emphasis in original). By linking ideology to basic cognitive and emotional processes, Wilson's (1973) formulation suggests that research on basic psychological and even neural responses could illuminate the dynamics of political ideology.

At least tacitly, Jost et al.'s (2003a, b) model assumes that individuals gravitate toward those ideas and opinions that “match” or “resonate” with their own needs, interests, and desires (cf. Jost 2009; Tomkins 1963). Because this psychological model involves some element of choice (or “elective affinity”), it is not well-poised to explain political preferences under established totalitarian regimes such as Communism or Fascism, which compel nearly all members of a society to support an official ideology (cf. Greenberg and Jonas 2003). In circumstances that provide at least some range (or “menu”) of possible opinions (i.e., in the absence of extremely strong situational pressures), Jost et al. (2003a, 2007) hypothesized that conservative ideology should be more appealing to individuals who are either temporarily or chronically high in needs to manage uncertainty and threat, whereas liberal ideology should be more appealing to individuals who are low in such needs. Presumably, this is because “preserving the [inegalitarian] status quo allows one to maintain what is familiar and known while rejecting the risky, uncertain prospect of social change” (Jost et al. 2007, p. 990).

Jost et al. (2003a, b) conducted a meta-analytic review of 88 studies conducted in 12 countries between 1958 and 2002, which confirmed that both situational and dispositional variables associated with the management of threat and uncertainty were robust predictors of political orientation. Specifically, death anxiety, system instability, fear of threat and loss, dogmatism, intolerance of ambiguity, and personal needs for order, structure, and closure were all positively associated with conservatism (or negatively associated with liberalism). Conversely, openness to new experiences, cognitive complexity, tolerance of uncertainty, and self-esteem were all positively associated with liberalism (or negatively associated with conservatism). Subsequent research has also demonstrated that liberals exhibit stronger implicit as well as explicit preferences for social change and equality when compared with conservatives (e.g., Jost et al. 2004a, 2008; Nosek et al. 2009).

Jost et al. (2007) pitted the model of ideology as motivated social cognition, which holds that needs to manage uncertainty and threat should be positively associated with adherence to conservatism (and negatively associated with adherence to liberalism), against alternatives in which these variables were hypothesized to be associated with ideological extremism in general (e.g., Greenberg and Jonas 2003; Hogg 2007) or only with extreme, authoritarian forms of right-wing ideology (Crowson et al. 2005). Each of these three studies, conducted in Texas,



**Fig. 1** Effects of uncertainty and threat management on political orientation as mediated by resistance to change and opposition to equality. *Note:* Numerical entries are unstandardized regression coefficients (followed by *standard errors* in parentheses). Figure adapted from Jost et al. (2007, Study 3). See also (partial) conceptual replications by Matthews et al. (2009) and Federico et al. (2011)

Massachusetts, and New York, supported the Jost et al. (2003a, b) model but not the alternative predictions. Specifically, Jost et al. (2007) found that uncertainty and threat management contributed independently and significantly to self-reported conservatism, even after adjusting for effects of ideological extremity. Furthermore, structural equation modeling revealed that resistance to change mediated the effect of uncertainty avoidance on political orientation, whereas opposition to equality mediated the effect of threat (see Fig. 1).

### Behavioral replications and extensions of the model

Federico et al. (2011) investigated the need for cognitive closure—an individual difference variable that is linked to uncertainty reduction—as a predictor of political orientation. In two studies, including one based on a nationally representative sample, they replicated Jost et al.'s (2007) finding that traditionalism (or resistance to change) mediated the positive effect of need for closure on right-wing conservatism, whereas opposition to equality did not. Indeed, several studies have replicated the basic relationship between epistemic motivation (i.e., personal needs for certainty, order, structure, and closure) and political orientation (Chirumbolo et al. 2004; Critcher et al. 2009; Federico and Goren 2009; Kimmelmeier 2007; Leone and Chirumbolo 2008; Sargent 2004; van Hiel and Mervielde 2004). It is similarly well-established that, in terms of personality characteristics, liberals score consistently higher on measures of openness to new experiences (e.g., Carney et al. 2008; Gerber et al. 2010; Jost 2006; Mondak 2010).

Shook and Fazio (2009) examined ideological differences in strategies of epistemic exploration in the context of a probabilistic learning task. In this task, participants viewed an array of “beans” that varied in terms of shapes that were probabilistically associated with gains or losses. To discover which shapes were associated with better (vs. worse) pay-offs, participants needed to adopt a strategy of early, extensive exploration that was risky in the short-term but ultimately beneficial. Shook and Fazio found that adherence to conservative ideology was associated with a more prudent but less informative learning strategy. Thus, liberals performed better on the task of exploration. One advantage of this type of paradigm is that it does not rely upon self-report measures of openness or novelty-seeking; rather, the authors gauged exploratory behavior indirectly, across many trials, in a relatively generic, apolitical context.

In terms of sensitivity to threat, Nail and McGregor (2009) observed that their survey respondents were more favorable toward conservatism, increased military spending, and President George W. Bush (and less favorable toward socialized medicine) after the 9/11 terrorist attacks (vs. shortly before). Weber and Federico (2007) found that anxious and avoidant (i.e., insecure) attachment styles were associated with right-wing authoritarianism and social dominance orientation, respectively (but see Thornhill and Fincher 2007, for a different pattern). The perception of a dangerous world is consistently related to the endorsement of right-wing ideologies (Jost et al. 2003a), especially among those who are high in political knowledge or expertise (Federico et al. 2009).

Several studies have revealed that sensitivity to disgust is also associated with the holding of politically conservative attitudes (Helzer and Pizarro 2011; Hodson and Costello 2007; Inbar et al. 2009a, b; Terrizzi et al. 2010; but see Tybur et al. 2010). For instance, experiments reported by Helzer and Pizarro (2011) demonstrated that simply asking research participants to sanitize their hands enhanced their affinity for social, economic, and political conservatism (and diminished their affinity for liberal ideology). Thus, an ever-expanding array of research programs confirms that heightened psychological needs to manage uncertainty and threat are positively associated with conservatism (and negatively associated with liberalism).

However, most of the findings we have reviewed so far involve cross-sectional, correlational methods that cannot establish directions of causality. Fortunately, several longitudinal and experimental studies have produced converging results. For instance, Block and Block (2006) followed individuals, beginning when they were in nursery school, for two decades and found that 3 year-olds who were rated by teachers as fearful, rigid, indecisive, vulnerable, and inhibited turned out to be more politically conservative as adults. By contrast, 3 year-olds who were described as more

energetic, resilient, self-reliant, expressive, dominating, and more prone to developing close relationships became more liberal in adulthood. These findings provide further evidence that personality traits and political orientation are linked (Caprara and Zimbardo 2004; Carney et al. 2008; Gerber et al. 2010; Mondak 2010).

A longitudinal study of college students by Matthews et al. (2009) demonstrated that perceptions of intergroup threat and anxiety measured during the first year of college were positively associated with scores on system justification and social dominance orientation (i.e., support for the status quo and for group-based hierarchies, respectively) during their second and third years, and these scores, in turn, were positively associated with political conservatism in the fourth year of college. Alternative models in which ideological variables were used to predict subsequent perceptions of threat and anxiety were unsupported. Bonanno and Jost (2006) studied high impact survivors of the 9/11 terrorist attack on the World Trade Center and found that three times as many survivors reported becoming more politically conservative (vs. more liberal) in the 18 months following the attack, regardless of partisan identification and prior voting patterns.

Experimental tests provide the strongest basis for concluding that increasing levels of uncertainty and threat lead to an affinity for conservative (vs. liberal) ideology. Accordingly, several laboratory studies reveal that reminding participants of terrorism and other existential threats (e.g., mortality salience primes) increases their approval of politically conservative leaders (Cohen et al. 2004, 2005; Gailliot et al. 2006; Lambert et al. 2010; Landau et al. 2004) and attitudes (Jost et al. 2004b; Nail et al. 2009; Ullrich and Cohrs 2007).

A series of experiments by Thorisdottir and Jost (2011) suggests that, in at least some cases, existential motivation increases epistemic motivation, giving rise to increased conservatism. Specifically, threat caused participants in general to exhibit motivated closed-mindedness (an aspect of the need for cognitive closure), which, in turn, was associated with self-reported conservatism and a greater affinity for the Republican (vs. Democratic) party. A field experiment involving center-right political delegates in Iceland revealed that three quite different types of threat (i.e., threats to the self, group, and system) led these delegates to score higher on motivated closed-mindedness and issue-based political conservatism (see Thorisdottir and Jost 2011).

### Neuroscientific contributions to testing and refining the model of ideology as motivated social cognition

Research on political psychology has begun to incorporate neuroscientific approaches in an emerging area of inquiry

within social cognitive neuroscience that might be termed *political neuroscience* (or perhaps *neuropolitics*). The goal of this approach is to integrate theories and methods from cognitive neuroscience with more traditional psychological approaches to investigate the neurocognitive mechanisms involved in political cognition and behavior (Cacioppo and Visser 2003; Lieberman et al. 2003; Theodoridis & Nelson in press). By linking ideological processes to physiological substrates, researchers may be in a better position to refine their behavioral models of political psychology, such as Jost et al.'s (2003a, b, 2007) model of political ideology as motivated social cognition. Among other things, physiological measures are useful for assessing implicit or automatic responses because they can index rapid responses and do not require overt responses. Therefore, they (like other implicit measures) can be used to minimize or circumvent self-presentational issues.

Initial research on political neuroscience has been largely exploratory, with the descriptive aim of mapping patterns of neural activity onto different types of politically significant responses (Kaplan et al. 2007; Knutson et al. 2006). Zamboni et al. (2009) measured brain activity using fMRI while participants read statements that varied in terms of ideological content (liberal vs. conservative) as well as extremity (moderate vs. radical) and level of abstraction (individual vs. society). The researchers sought to determine whether these three dimensions of political cognition might correspond to different networks of brain activity. Participants, who varied in terms of their own self-identified political orientation, simply read and indicated their level of agreement with each of the statements while brain activity was recorded.

Zamboni et al. (2009) found that, regardless of participants' own political orientation, the processing of conservative statements was associated with greater activity in the right dlPFC—a brain region that is associated with withdrawal motivation, negative affect, and response inhibition in prior research (e.g., Aron et al. 2004; Davidson 1992; Harmon-Jones 2003). Although this finding may have multiple interpretations, one could speculate that thinking about more conservative positions elicited a withdrawal-oriented response among these participants, which would be consistent with responses to disgusting or threatening stimuli (cf. Helzer and Pizarro 2011; Terrizzi et al. 2010). This pattern of activation was unrelated to the extremity or level of abstraction of political statements.

### Ideology and conflict monitoring

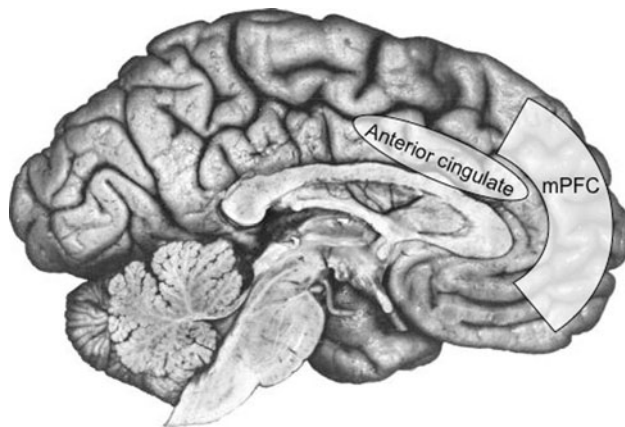
More recently, research adopting a political neuroscience approach has begun to address the motivational basis of political ideology—especially in terms of epistemic and existential motivation—by linking ideological outcomes to domain-general processes having to do with conflict

monitoring and threat processing. Amodio et al. (2007) investigated left-right ideological differences in epistemic processes, as instantiated in relatively low-level neurocognitive functioning, by linking individual differences in political orientation to an important aspect of self-regulation known as *conflict monitoring* (or “performance monitoring”). More specifically, they 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; Botvinick et al. 2001). To test this prediction, Amodio et al. compared participants' self-reported political orientation, ranging from extremely liberal to extremely conservative, with behavior and neural activity on a “Go/No-Go task.”

In the Go/No-Go task used by Amodio et al. (2007), participants must quickly respond to a frequently presented “Go” stimulus (e.g., the letter “W”), so that the Go response becomes habitual. However, on a small proportion of trials, a “No-Go” stimulus appears (e.g., the letter “M”), signaling that one's habitual response should be withheld. Although the participant's explicit goal is to withhold a response to this stimulus, the prepotent “Go” response creates a response conflict. Conflict monitoring on tasks such as this has been linked to activity in the anterior cingulate cortex (ACC; see Fig. 2) in a number of ERP and fMRI studies (Carter et al. 1998; Nieuwenhuis et al. 2003). In particular, conflict-related ACC activity is reflected in the amplitudes of the error-related negativity (ERN) and N2 components of the ERP. Amodio et al. (2007) assessed political ideology in a straightforward manner by asking participants to locate themselves on an 11-point continuum ranging from “extremely liberal” to “extremely conservative” (see Carney et al. 2008; Jost 2006).

Consistent with the model of political ideology as motivated social cognition (and previous research indicating that liberals are more open, cognitively flexible, and tolerant of ambiguity and uncertainty than conservatives), liberalism was associated with greater behavioral accuracy on No-Go trials of the task (i.e., trials involving response conflict and requiring a change in one's response pattern). Furthermore, liberals exhibited significantly larger ERP responses indicative of greater ACC activity 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 (see also Shook and Fazio 2009).

It is notable that Amodio et al.'s (2007) study differed from nearly all other political neuroscience studies in that it did not examine responses to a task involving political information or political judgments (cf. Kaplan et al. 2007;



**Fig. 2** Medial aspect of the *left* hemisphere of the brain showing the anterior cingulate and medial frontal regions. mPFC = medial prefrontal cortex

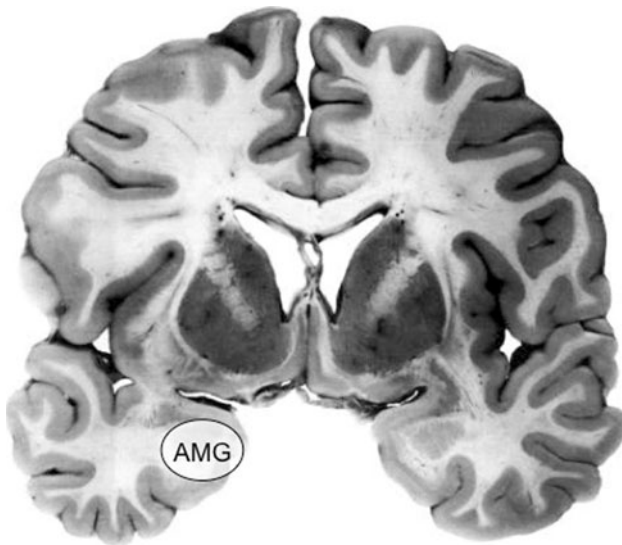
Knutson et al. 2006; Westen et al. 2006; Zamboni et al. 2009). Rather than incorporating an explicitly ideological component to an otherwise cognitive or affective task, Amodio et al. focused directly on the neurocognitive process that the task was designed to model, and then compared ideological differences in general processing styles. For a variety of reasons, then, these differences are not attributable to self-presentation, social desirability, or other confounding factors. They speak to the intriguing possibility that left-right ideological differences are manifestations of fundamental psychological (and even neural) processes, although it is important to point out that the causal direction between brain and behavior cannot be inferred on the basis of this study alone.

The findings of Amodio et al. (2007) have been replicated and extended in a few provocative ways. For instance, Weissflog et al. (2010) assessed ERP responses while a sample of Canadian university students who varied in political orientation completed the Go/No Go task. Once again, a stronger liberal orientation was associated with larger No-Go N2 amplitudes, indicating greater conflict-related ACC activity, and thus replicating the results of Amodio et al. (2007). In addition, larger No-Go N2 and ERN amplitudes were associated with greater endorsement of egalitarian values and lesser endorsement of right-wing authoritarianism. Related findings by Inzlicht et al. (2009) indicated that religiosity was associated with smaller ERNs in response to errors on a color-naming Stroop task. Given the strong association between conservatism and religiosity, this finding is broadly consistent with the results of Amodio et al. (2007), Shook and Fazio (2009), and Weissflog et al. (2010). In sum, these results suggest that a more liberal ideology is associated with stronger motivation to seek out new information and integrate potentially conflicting pieces of information in order to arrive at a relatively complex understanding of reality.

## Ideology and threat sensitivity

The relationship between political ideology and existential factors was examined at a physiological level by Oxley et al. (2008). Based on the psychological literature, including that summarized by Jost et al. (2003a), Oxley et al. hypothesized that heightened physiological sensitivity to threat would be positively associated with conservative or right-wing orientation. Political orientation was measured in terms of attitudes toward military spending, capital punishment, school prayer, gay marriage, gun control, patriotism, and abortion rights. Adult residents of Lincoln, Nebraska who differed in terms of their political views were administered two tasks that are commonly used to gauge threat sensitivity. In one task, participants viewed threatening images (e.g., of spiders, bloody faces, and rotten food), in comparison with neutral and positive images, while the experimenters measured their skin conductance responses (SCR). Heightened SCR reflects increased sweat gland activity associated with a sympathetic nervous system response that is characteristic of fear. As hypothesized, participants who held right-wing (vs. left-wing) views exhibited significantly larger SCRs in response to these threatening images, whereas SCRs to neutral and positive images were uncorrelated with political views. This pattern remained statistically significant after adjusting for the effects of age, gender, education, and income.

Second, Oxley et al. (2008) examined the defensive startle reflex, which was indexed in terms of the magnitude of participants' eyeblink in response to a very loud and unexpected burst of white noise while they viewed a fixation cross on a computer monitor. Stronger contraction of the muscle surrounding the eye (orbicularis oculi) indicates a stronger reflexive defensive reaction to the startling event. All participants exhibited the typical eyeblink reflex in response to the noise burst, but this defensive reaction was significantly stronger for participants who held right-wing (vs. left-wing) views, after adjusting for age, gender, and socioeconomic status. It is noteworthy that the magnitude of the startle eyeblink response can be modified by a person's affective state at the time they are startled. This type of affect-state modulation reflects input from the amygdala to the startle-reflex circuit (Davis 2006; LeDoux 2000; see Fig. 3); thus, it is possible that Oxley et al. observed differences in the way liberal and conservative participants responded to the experimental context (which may have been perceived as aversive for some given the threat of the startling noise blasts). To the extent that the observed differences in eyeblink response reflected differences in affective states, these results would point to differences in amygdala activity related to ideology. However, it is important to point out that the method used by Oxley et al. (2008) to assess the startle-eyeblink reflex does not permit a



**Fig. 3** View of coronal slice through brain illustrating the amygdala (AMG)

clear inference about the role of the amygdala in reflecting or contributing to one's political orientation.

#### Ideological differences in neuroanatomical structure?

Whereas most studies in political neuroscience have examined associations with functional brain activity, Kanai et al. (2011) explored the relationship between political orientation and brain structure volume. That is, they considered the possibility that the brains of conservatives and progressives would differ in terms of physical structures. More specifically, they assessed regional brain volume in a sample of 90 British university students and observed significant correlations between ideology and brain volume in two major brain structures: the ACC and the right amygdala. Consistent with the activation findings of Amodio et al. (2007), larger ACC volume was associated with greater liberalism (or lesser conservatism). Furthermore, larger right amygdala volume was associated with greater conservatism (or lesser liberalism), which is conceptually related to the findings of Oxley et al. (2008). This pattern of results held after adjusting for participant age and gender and was replicated in a second sample of 28 participants.

Given that the ACC is associated with conflict monitoring and the amygdala is centrally involved in physiological and behavioral responses to threat, this neuroanatomical evidence appears to lend further support to the notion that political ideology is linked to basic neurocognitive orientations toward uncertainty and threat, as hypothesized by Jost et al. (2003a, b, 2007). At the same time, caution is warranted in such interpretations because some nuclei within the amygdala, such as the basal nucleus, are also responsive to reward and associated with

appetitive responses. It is also important to point out that in all neuroscientific studies of political orientation, the direction of causality is ambiguous; it could be that (a) differences in brain activity lead to liberal-conservative ideological differences, or (b) embracing liberal vs. conservative ideologies leads to differences in brain structure and function (see also Jost 2009).

#### Genetic studies of political attitudes

In an effort to better understand the origins of ideology, researchers have explored associations between genes and various political and religious attitudes and behaviors (e.g., Alford et al. 2005; Hatemi et al. 2011; Waller et al. 1990). An extensive analysis of the heritability of personality and attitudes was conducted by Olson et al. (2001). In a study of 195 monozygotic and 141 same-sex dizygotic American twin pairs, these researchers observed strong heritability effects for attitudes toward capitalism, abortion, education, capital punishment, and organized religion, among other attitude objects. Many studies involving quite diverse samples and methods suggest that political and religious views reflect a reasonably strong genetic basis, but this does not mean that ideological proclivities are unaffected by personal experiences or environmental factors.

Twin studies of heritability are suggestive of genetic factors in social and political attitudes, but they do not specify the biological or psychological mechanisms that could give rise to ideological differences. Recently, researchers have turned to molecular genetics approaches, which involve sampling subjects' DNA from blood or saliva, and identifying individual differences, or *polymorphisms*, in a particular gene (Canli 2009). For example, Fowler and Dawes (2008) examined polymorphisms in two specific genes commonly studied in psychology research—the serotonin transporter gene (5HTT) and monoamine oxidase A gene (MAOA)—and found that both polymorphisms were predictive of voter turnout. Although the specific psychological significance of these polymorphisms remains poorly understood, 5HTT has been associated with individual differences in mood (e.g., anxiety), and individuals carrying at least one “short” allele of this gene have been found to be more vulnerable to mood disorders following extremely stressful life events (Caspi et al. 2002). Furthermore, research suggests that 5HTT may play a role in the regulation of stress and fearful emotion through its interactions with the amygdala (Hariri and Holmes 2006). MAOA has also been linked to antisocial and aggressive behavior in men. Of greater pertinence to the explanation of ideological differences, Hatemi et al. (2011) observed that genetic polymorphisms linked to both cognitive flexibility and threat sensitivity predicted scores on a general attitudinal measure of liberalism-conservatism.

## Concluding remarks

We began this article by noting that ideology is a truly powerful motivational force and that it might, under some circumstances, even eclipse the motivation for self-preservation. As Koestler (1978) pointed out, “wars are not fought for personal gain, but out of loyalty and devotion to king, country or cause” (p. 14; see also Dember 1991). This does not, however, necessarily mean that all ideologies are motivated by the same psychological needs or goals. We have reviewed extensive behavioral as well as neuroscientific evidence indicating that epistemic and existential motives to attain certainty and security (or, conversely, to resolve ambiguity and threat) are positively associated with attraction to conservative (or rightist) ideology but negatively associated with attraction to liberal (or leftist) ideology. Taken as a whole, these findings support and extend Jost et al.’s (2003a, b, 2007) model of political ideology as motivated social cognition.

More generally, the development of research on epistemic and existential underpinnings of left-right (or liberal-conservative) ideology bodes well for the future of *political neuroscience*. In this review, we have sought to emphasize the ways in which the same theoretical assumptions can be tested at various levels of analysis using converging, multiple methods that transcend the shortcomings of any specific technique. We submit that because of the recent research activities of many different laboratories employing diverse scientific approaches and procedures, we now know much more about the psychology and neuroscience of political ideology than we did just a decade ago. It may be impossible to predict how much more scientists will understand a decade from now about the social, cognitive, and motivational structures and functions of political belief systems, especially if cooperation among psychologists, political scientists, neuroscientists, and geneticists simply continues apace. This interdisciplinary synergy will likely prove useful in understanding and reducing the sources of ideological acrimony that encourage incivility and obstruct progress in our politics and our society.

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