Political preferences and threat perception: opportunities for neuroimaging and developmental research

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Abstract

People have preferences for how their social environment is organized and governed. One influential explanation of variation in these preferences focuses on individual differences in sensitivity to threats. Recent research demonstrates that this relationship is not only a function of the degree of sensitivity (greater or lesser), but also of the danger in question (i.e., immigration or climate change) and the kind of potential harm it poses (i.e., physical pain or contamination). Since many political issues are not unambiguously of one kind, the structure of an individual's reactions to perceived political threats is also uncertain. We argue that future research should (i) use functional neuroimaging to test these structures and (ii) investigate the role of social learning in their transmission.

Introduction

People have preferences for how their social environment is organized and governed. These preferences differ between individuals, and can persist within individuals over decades, e.g., [1]. For example, some people prefer to prioritize communal order over personal independence [2]. Similarly, some people prefer to prioritize feelings of security over novelty [3]. The overall structure of people's preferences for social and political organization is often called an ideological orientation (for a discussion, see [4]).

What is the origin and proximal mechanism of these preferences? Specifically, how do people from the same society, and even the same family, come to have different preferences for social organization and government?

One influential hypothesis has been that ideological orientations may derive from prior differences in people's sensitivity to danger. That is, people may have predispositions to react more or less vigorously in dangerous situations. People who experience strong aversion would come to perceive the external world as more threatening. This sensitivity might then lead people to prefer to invest in defending society and the social order against threats. Across multiple measures, people with conservative or right-wing ideological orientations appear to be more sensitive to danger [5].

Although this model has generated many useful observations, it is oversimplified in at least two ways. First, people do not perceive only "greater" and "lesser" threats, but threats of qualitatively different kinds. Threats of physical harm versus contamination evoke different proximate psychological and neural reactions, within a single individual. Differences between individuals in political threat perceptions could thus arise from more than one proximate mechanism. Second,

most political issues are not unambiguously and intrinsically defined by a specific kind of threat. Complex issues, like climate change or immigration, can be perceived as posing more than one kind of threat. For example, some are more concerned with immigration as a threat to cultural purity while others worry more about the possibility that immigrants are violent criminals or terrorists [6]. Similarly, climate change is thought of as an existential risk, but also as a purity violation [7]. Interpersonal and intergenerational transmission of political preferences must therefore involve not only heritable predispositions, but also transfer of conceptual representations.

In this article, we sketch how future research should (i) use functional neuroimaging to test the structure, both within and across individuals, of people's reactions to perceived threats, and (ii) directly test the role of social learning in the transmission of these reactions across people. Taken together, these two research programs will more precisely specify the relationship between threat perception and political preferences, and provide a better understanding of the causal mechanisms at work.

Ideological orientation and danger

Broadly construed, an individual's ideological orientation consists of the bundle of attitudes and preferences for how the social and political world should be organized (and the way in which that organization should be achieved) [4]. This orientation is often expressed in one dimension (left-right or liberal-conservative) or two dimensions (social and economic), though there are other formulations and proxies, such as Social Dominance Orientation [8], and Right-Wing Authoritarianism [9].

Using these classic measures, conservatives perceive more physical dangers to society and to themselves (e.g., more fear of terrorism) than liberals (for a recent meta-analysis of this relationship, see [5]). When concern for physical bodily harm is mitigated, conservative individuals can become (presumably, briefly) slightly more liberal [10]. In addition, compared to liberals, conservatives are more sensitive to threats of contamination, report feeling more disgusted on standard measures [11] and avoid attending to disgusting stimuli [12].

Political psychologists have debated which of these kinds of sensitivity offers a better explanation of individual differences in ideological orientation - fear of violent harm or disgust sensitivity - or whether both are expressions of a single underlying trait (i.e., negativity bias) (see the exchange between [13], [14], and [15]).

However, neuroimaging experiments suggest that fear in response to threat of physical harm, and disgust in response to threat of contamination, arise from at least partially distinguishable psychological and neural mechanisms within individuals [16–18]. Thus it is plausible that both kinds of responses vary across individuals, because they originate in separable neural systems. Indeed, some research already suggests that individual differences in fear and disgust are only moderately correlated (e.g., [19,20]).

Also, although conservatives frequently seem to be more sensitive to both fear- and disgust-eliciting stimuli than liberals, this pattern may actually be a consequence of the chosen elicitors. Many such studies measure responses to a limited set of threats (e.g. terrorism for physical harm, sexual behaviours for contamination). It may be that liberals have equally strong aversive reactions to threats, but in response to different elicitors. For example, liberals may strongly fear the physical harm that may come from climate change, or feel disgust at corporate

greed. Broader question batteries demonstrate that there are threats that concern both liberals and conservatives (e.g., government corruption) and threats that concern one group more than the other (e.g., environmental pollution) [21–23*]. Heightening the salience of liberal concerns can (presumably briefly) shift political orientation to the left [24*], just as heightening the salience of terrorism can shift political orientation to the right [25]. Similarly, the strength of association between conservatism and disgust sensitivity is determined by the specific elicitors included in the study [26*]. Across five studies of German and American adults, the relationship between disgust and conservatism could be positive (as for homosexuality), negative (for environmental pollution), or null (for rotting meat); further, non-specific disgust sensitivity (no elicitors) was unrelated to conservatism.

Are these parallel concerns of liberals and conservatives really instances of the same *states*? How could we test whether the emotional reactions that liberals call "fear of climate change" are meaningfully similar to those conservatives call "fear of terrorism"? Or, analogously, that what liberals call disgust at corporate greed is meaningfully similar to what conservatives call disgust at promiscuity?

These questions require methods that can distinguish between states within an individual (e.g., fear versus disgust within conservatives), and directly measure the similarity of states, between individuals (e.g., fear in liberals versus fear in conservatives). For both these purposes, we recommend that future studies use neuroimaging.

Defining the relationship

Reactions to perceived danger have long been a topic of study in neuroscience. Foundational neuroimaging research in humans focused on mapping brain regions that were, on average,

more active when subjects were exposed to threatening as opposed to neutral stimuli (for example reviews, see [27,28]). In the political domain, this type of mapping exercise contributed confirmatory evidence for existing models, including those focused on threat perception (for a review, see [29]).

Recently, more nuanced patterns of brain activation, neural representations, have become the focus of research. A neural representation refers to a pattern of brain activity "that serves the purpose of conveying information that specifies perceptions, thoughts, or any other mental content" and contributes to behavior [30]. For our purposes, it is important to note that this shift towards focusing on representations was facilitated by innovations in the analytic techniques deployed with neuroimaging data [31,32]. In particular, we want to highlight the use of multi-voxel pattern analysis (MVPA) for classification and for representational similarity analysis (RSA). What distinguishes MVPA techniques from approaches that focus on average activation across brain regions is that they can take advantage of the neural information contained in smaller units of spatial resolution (e.g., voxels).

Pattern classification

Classification methods use machine learning tools to quantify how separable patterns of neural activity are from one another. Classifiers have been used to distinguish the neural representations of the concepts of ingroup and outgroup [33], directly threatening versus neutral stimuli [34,35], and threat-related emotional responses from one another, such as fear versus disgust (e.g., [36]). For comprehensive reviews, see [16,17]. Emotional intensity has also been successfully classified and distinguished from the experience of pain [37].

Pattern classification could be used to test a number of basic questions about the proximal basis of ideological orientation. A plausible definition of threat sensitivity is how accurately we can classify threatening from non-threatening stimuli, based on patterns of neural responses within an individual. Thus, if we expect a positive relationship between threat sensitivity and conservatism, we can ask: are threatening versus non-threatening stimuli classified more accurately from neural responses in conservative versus liberal individuals? If this sensitivity extends to the acuteness with which individuals experience the threat-relevant emotions of fear and disgust, we can also ask: are individual differences in classification accuracy for threats of physical harm, and/or for threats of contamination, correlated with ideological orientation? We can also explore the question of comparable threat perception across the ideological spectrum: can a classifier trained on types of non-political threats (e.g. snakes, rotting meat) be used to classify neural representations of political or interpersonal threats? Do the accurately classified targets vary according to ideological orientation? If liberals fear climate change in the same way that conservatives fear terrorism, then a classifier trained to identify neural representations of fear should be equally accurate in classifying neural representations in liberals and conservatives, but for different elicitors.

Representational similarity

Representational similarity methods use measures of relatedness (e.g., distance, correlation) to characterize how close patterns of neural response are to one another in high-dimensional spaces (see [38] for a discussion of these techniques and [39] for a synthesis of the mathematics involved in modeling neural representations). RSA has been used to compare the neural representations of learned fear and pre-existing fear [40**] and to characterize complex social constructs, such as stereotypes [41].

RSA could be used to answer several questions about how individuals vary in their neural representations of politically-relevant stimuli. We argue that these types of stimuli (e.g., prompts to consider interacting with an immigrant or the consequences of climate change) could evoke a number of different representations. We can directly measure this heterogeneity by asking: within each individual, how similar are representations of politically-relevant stimuli to non-political fear- and disgust-elicitors (e.g., snakes)? Across individuals, do representations of the same stimulus cluster with different non-political elicitors? Are these clusters related to ideological orientation? We can also ask more broadly what might be missing in our understanding of politically-relevant threat representations: are there other shared components of threat representations (beyond fear- and disgust-elicitation) that explain their relatedness (e.g., self-relevance, stakes)? These types of exploratory analysis could be used to more fully characterize how politically-relevant stimuli are represented in the brain.

In summary, neuroimaging offers a means by which individual-level differences (and group-level averages) in how potential threats are perceived can be measured and characterized. While prior research has investigated the indirect relationship between neural response to non-political threats and political orientation (e.g., [42]), we propose directly measuring and characterizing the neural representations of the targets of interest. The goal of this research would be to identify the specific threat perceptions that underlie political preferences in individuals and in groups.

Origin stories

Characterizing the relationship between specific threat perceptions and political preferences in adults leaves open a critical question about the causal origin of these perceptions. How do

people acquire the specific threat perceptions that underlie political preferences? How do different political issues become associated with the "same" threat perceptions?

One possibility is that organisms "know" certain dangers when they are first encountered, i.e. they are innate at some level. Even very young infants preferentially attend to stimuli associated with fear in adults (e.g., snakes and spiders, heights, strangers); however, this bias in attention is only accompanied by negative affect under certain circumstances and so is not equivalent to fearfulness [43**]. Negative responses to social threatening stimuli (e.g., faces) appear earlier in development than responses to threatening non-social (animal) stimuli, though both would be harmful to the very young [44]. Sensitivity to different types of disgust-inducing threats also emerges over early childhood, and is largely absent when infants and toddlers are most vulnerable to infection and disease. Feeling disgusted by other people (as opposed to bodily fluids or animals) appears particularly late, around 7 years of age [45].

Thus, associations between stimuli and states are not necessarily instantiated at the first encounter. Infants encounter animals without automatically becoming afraid of them; children similarly encounter individuals and items that engender disgust responses later in life without being disgusted by them. This sequence suggests a role for learning.

The dangerousness of a stimulus can be learned in a number of ways, including direct personal experience, social observation, and social instruction (for a review of these models, see [46,47]). Learning through social observation occurs when one individual watches another have a personal experience (e.g., eating a poisonous berry and becoming ill), also called vicarious learning. Learning through social instruction occurs when one individual communicates information deliberately, often explicitly (e.g., warning that eating the berry will result in

illness). All three forms of learning can lead to a neutral stimulus being represented as a threat, whether or not that representation is objectively justified [48]. For example, children can learn to morally condemn arbitrary novel actions [49] and learn to form demeaning associations with novel outgroups [50] after adults voice judgments. Adults also willingly transmit threat-relevant information to one another, even when there is a low probability of harm, and a high probability of a positive outcome [51*]. Moreover, learned threat representations do not necessarily update when the environment changes and greater advantage would be accrued by treating the stimulus as non-threatening [52]. That is, they are not easily unlearned.

Developmental research approaches

To investigate how specific threat perceptions are acquired, we can use research approaches from developmental psychology. For example, we can ask how threat perceptions are transmitted from parents to children. Children's attitudes towards social groups are correlated with their parents' political attitudes [53]. Similarity between parents and children, for example in overall fearfulness, is partly explained by shared genes, but the family environment is also important [54,55]. Parents transmit values in subtle ways: for example, parents express similar admonitions using different prosody, in response to moral (harming others) versus pragmatic (creating inconvenience) transgressions [56]. In another example, parents' gendered behaviors in the first six years of their child's life were shown to be better predictors of their children's gender-role attitudes at age six than parents' own stated gender-role attitudes [57]. A similar study design could be used to understand the contributions of parental behavior, versus explicit parental communication, to the beliefs about those threats that develop in early childhood. This type of study could also be deployed to study peer-to-peer transmission of threat representation in older children and adolescents.

All of these methods measure behavior and cognition during development. However, it is also increasingly possible to directly measure neural representations in children [58] and adolescents [59] Thus, future research could investigate the initial emergence of neural representations of threat perception, when those representations are evoked by political issues, and what kind of transmission most rapidly induces or modifies these representations.

In summary, developmental research methods should be used to investigate not just the general tendencies emerging in childhood that appear relevant for broader ideological orientation (e.g., trait fearfulness [60]), but also the causal mechanism by which specific threat perceptions become linked to specific political preferences.

Conclusion

Ideological orientation and political preferences more generally relate in part to an individual's appraisals of the dangers in the environment and how they would best be mitigated. Here, we have proposed that the tools exist to integrate more proximate measures of threat perception - neural representations - into our understanding of the relationship between psychological responses to danger and political preferences.

We have also argued that social learning is likely an important factor in the acquisition of threat representations, which are willingly and deliberately transmitted. This process of acquiring threat representations may have important consequences for how we understand our political preferences, those that we express around the dinner table or in the voting booth.

Acknowledgements

Declaration of Interest

None

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