How Can People "Sacrifice Life for Righteousness" ? An Explanation Based on the Cognitive Neural Mechanisms of Protective Values

Authors: Yue Tong, Huang Xiting, Fu Anguo, Huang Xiting

Date: 2020-10-22T00:00:00+00:00

Abstract

Protective values constitute a notion that rejects trade-offs with any other values, particularly economic values. Recent evidence from cognitive neuroscience research indicates that people' s ability to exhibit "sacrificing life for righteousness" behaviors (such as resisting temptations of interest or even relinquishing life) in order to uphold protective values stems from two factors: first, protective values are represented and constructed through deontological absolute rules, which reduces cost-benefit deliberation; second, protective values are intimately associated with self and moral identity processes, thereby being subjectively endowed with supreme value. Future research should, on the basis of further elucidating the neural mechanisms of protective values, address issues of cultural differences and undertake applied practical studies on the intervention and proper guidance of protective values.

Full Text

Preamble

Why Do People "Sacrifice Life for Righteousness" ? An Explanation Based on the Cognitive Neural Mechanisms of Protected Values

YUE Tong[1], HUANG Xiting[1], FU Anguo[2]
[1]Research Center for Psychology and Social Development, Southwest University; School of Psychology, Southwest University, Chongqing 400715, China
[2]School of Management, Hainan University; Hainan Institute of Corporate Governance, Haikou 570228, China

Abstract

Protected values refer to concepts that individuals refuse to trade with any other values, particularly economic ones. Recent cognitive neuroscience evidence reveals why people can exhibit "sacrifice life for righteousness" behaviors to uphold protected values—defying material temptations or even relinquishing life itself. On one hand, protected values are represented and constructed through deontological absolute rules, which reduces cost-benefit deliberation. On the other hand, their close association with self-identity and moral identity processes subjectively endows them with supreme importance. Future research should further clarify the neural mechanisms of protected values, examine cultural differences, and develop practical interventions for their proper guidance.

Keywords: protected values, cognitive neural mechanism, deontological, utilitarian, backfire effect

Introduction

Over two millennia ago, the Warring States philosopher Mencius articulated a powerful value judgment: "Life is what I desire; righteousness is also what I desire. If I cannot have both, I will choose righteousness over life." Chinese Confucian intellectuals pursuing "the great path under heaven" were expected to remain unswayed by wealth and power, unyielding to poverty and hardship, and unbent by force. This steadfast commitment to ultimate values and beliefs has sustained the Chinese nation through existential crises, enabling countless individuals to maintain their integrity despite temptations or life-threatening coercion, serving as a crucial foundation for Chinese civilization' s continuity.

Western religious culture offers parallel examples of abandoning secular life for faith (such as asceticism) or even martyrdom, long revered among believers. These behavioral patterns contradict both economics' "rational actor" hypothesis and animals' fundamental instinct for self-preservation. Sacrificing tangible interests or confronting death threats for value beliefs appears uniquely human, reflecting the transcendent dimension of human spirit.

Psychological research typically examines this phenomenon through the lens of "protected values" (also termed sacred or absolute values). Protected values are characterized by individuals' refusal to trade the valued object with other valuable entities, especially those of merely economic worth (Baron & Spranca, 1997; Baron & Jonathan, 2017; He & Xi, 2005). Operationally, researchers identify protected values through two primary methods: first, questionnaire measurement using the Protected Values Questionnaire (Dogan et al., 2016; Duc, Hanselmann, Boesiger, & Tanner, 2013; Hanselmann & Tanner, 2008; Tanner et al., 2009), which includes nine items—four measuring resistance to monetary trade-offs and five assessing emotional opposition to value violations, with total scores indicating protection level. Second, the Becker–DeGroot–Marshak (BDM) auction task, where values that individuals refuse to sell at any price are classified as protected (Berns, Bell, et al., 2012; Pincus, Laviers, Pri-

etula, & Berns, 2014). These values encompass fundamental religious beliefs, moral norms (e.g., integrity, honesty), and core concepts of national and ethnic identity (Berns, Prietula, et al., 2012; Li & Huang, 2013). Notably, values are not universal but shaped by cultural environment and personal experience. For instance, studies with university students reveal that theology majors hold more protected values than economics majors (Duc, Hanselmann, Boesiger, & Tanner, 2013; Tanner et al., 2009). In essence, protected values represent the absolutization and sanctification of certain values through specific experiences and cultural shaping, providing core and enduring motivation for achieving ultimate life goals.

Since the concept' s introduction to psychology, extensive research has explored the processing characteristics and social functions of protected values. Studies show that when monetary compensation forces compromise on protected values, individuals experience negative emotions (e.g., anger, disgust) (Atran & Ginges, 2012; Sheikh, Ginges, Coman & Atran, 2012) and strengthen their original commitments, creating a "backfire effect" (Bénabou & Tirole, 2011; Sandel, 2012). Moreover, because different groups' historical and cultural backgrounds produce divergent protected values with absolute and transcendent qualities, intergroup understanding and dialogue become difficult, contributing to cultural and intergroup conflicts (Ginges, Atran, Medin, & Shikaki, 2007; Atran & Ginges, 2012; Sheikh, Gómez, & Atran, 2016).

However, these studies largely summarize and describe protected values phenomenologically, failing to adequately explain how they resist cost-benefit tradeoffs (e.g., monetary temptations or life threats) to manifest absoluteness and transcendence. Recent advances in cognitive neuroscience and functional magnetic resonance imaging (fMRI) now enable investigation of the psychological and neural processing mechanisms underlying protected values (Vilarroya & Hilferty, 2013), offering more direct evidence for understanding "sacrificing life for righteousness" —the abandonment of self-preservation instincts to uphold value beliefs. This paper reviews previous research, first examining the representation and construction patterns of protected values, then elucidating their mechanisms for resisting trade-offs from a cognitive neuroscience perspective, and finally summarizing findings and proposing future research directions to deepen systematic understanding of protected values' operating principles and provide theoretical insights for cultivating and intervening in proper values in practice.

2. Representation and Construction Patterns of Non-Protected and Protected Values

Values are essentially abstract conceptual representations and collections of social rules. Research indicates that value-based decision-making follows two primary modes: utilitarian and deontological. The former operates within a utility framework, making decisions based on cost-benefit analysis and profit maximization, while the latter emphasizes judgment of an act' s nature rather than its

outcomes, featuring absolute right/wrong distinctions similar to moral intuition (Baron, 2009). Many non-protected values are processed according to utilitarian principles, whereas protected values are more likely represented and constructed deontologically.

2.1 Non-Protected Values: Value-Maximizing Processing After Cost-Benefit Trade-Offs

In many contexts, values are not absolutely stable psychological structures. Some researchers argue that values are self-evident truths lacking necessary cognitive support, making certain non-protected values susceptible to external persuasion and social pressure (Hitlin & Piliavin, 2004). Recent neuroimaging reveals that changing non-protected values under external influence involves the brain' s value-assignment system: the ventromedial prefrontal cortex (vmPFC) and ventral striatum (VS) are core regions for human value assignment, playing crucial roles in processing rewarding stimuli (both primary, like food, and secondary, like money) (Bartra, Mcguire, & Kable, 2013; Levy & Glimcher, 2012; McNamee, Rangel, & O' Doherty, 2013). Individuals alter their non-protected values under persuasion or social pressure largely due to profit-maximizing considerations—abandoning original values for new options subjectively assigned greater economic or survival value. For example, Cooper, Bassett, and Falk (2017) found that when persuading sedentary individuals to adopt healthy lifestyles, the functional connectivity strength of their value-computation system correlated with subsequent reduction in sedentary behavior: stronger activation and connectivity between vmPFC and VS in response to "increase physical activity" messages predicted greater reductions in sitting time. This suggests health concepts may lead some sedentary individuals to recognize health benefits, weigh them mentally, and modify their lifestyle principles according to self-interest maximization. Similarly, as social animals, humans benefit from aligning with group opinions, which is often optimal for survival. Nook and Zaki (2015) examined how individuals' health evaluations of foods shift under peer influence, finding that vmPFC activity increased when participants adjusted their health ratings to match peers' views. This indicates individuals perform value calculations under peer pressure and modify beliefs to obtain tangible benefits.

Thus, although values are socially acquired concepts and rules that directly influence daily choices, many originally held value principles yield to practical interests when facing trade-offs. Pursuing benefits and avoiding harm often represents the optimal value choice. However, if all values followed this pattern, transcendent beliefs like "sacrificing life for benevolence and righteousness"would be impossible. Protected values can resist or bypass cost-benefit deliberation, persisting regardless of personal gain or loss, suggesting unique representation and construction patterns.

2.2 Protected Values: Absolute-Rule Processing Based on Deontological Principles

Since the concept' s inception, researchers have proposed that protected values differ from non-protected ones, being represented and constructed more deontologically—judging right and wrong based on the act itself rather than its consequences. This view has gained increasing neurophysiological support. For instance, Berns, Bell, et al. (2012) found that protected value representation and processing primarily activated the ventrolateral prefrontal cortex (vlPFC) and temporo-parietal junction (TPJ)—the former associated with semantic rule extraction and processing (Sharot, Kanai, Marston, Korn, Rees, & Dolan, 2012), and the latter involved in moral judgment of beliefs (Young et al., 2010). In contrast, non-protected value processing more heavily engaged the inferior parietal lobules (IPL), a region linked to utilitarian value computation and decision-making (Bhanji, Beer, & Bunge, 2010; Kable & Glimcher, 2009).

Subsequently, Pincus, LaViers, Prietula, and Berns (2014) reported similar findings: participants processing protected value statements showed greater vlPFC activation (a rule-extraction region) compared to non-protected values, suggesting protected values are stored in the brain as absolute rules. Moreover, Pincus et al. (2014) attempted to influence value commitment through peer conformity pressure (psychological stress when surrounding peers disagree). They found that individuals less susceptible to social pressure showed stronger vlPFC activation, indicating individual differences in rule-based representation of protected values—those who construct them more as deontological principles hold them more firmly. These results demonstrate that protected values possess unique representation and construction patterns, with this neural architecture determining absolute-rule-based rather than cost-benefit-based processing.

Additionally, protected value representation and construction may involve self-representation and emotional processing. Kaplan et al. (2016a) presented participants with real-life stories containing protected and non-protected values selected from over 20 million online blogs, recording neural responses. Results showed that reading these stories activated default network regions including posterior medial cortices (PMC), medial prefrontal cortex (mPFC), and TPJ, with protected value stories producing stronger activation than non-protected ones. Kaplan et al. (2016a) concluded that protected value representation involves brain processes of self-identity, moral judgment, and social emotion. Kaplan, Gimbel, and Harris (2016b) subsequently examined brain processing when strongly held protected values (liberalism vs. conservatism) faced counterevidence. They found that political belief processing activated default network regions more than non-protected values. At the individual difference level, those who maintained original beliefs under counterevidence showed stronger activity in dorsomedial prefrontal cortex (dMPFC), insula, and amygdala. Kaplan et al. (2016b) interpreted this as reflecting how individuals use emotional arousal to counter threatening information during protected belief maintenance. In summary, protected value representation and construction are linked to self and

moral identity, elevating their importance and enabling emotional resources to counter external challenges.

3. Sacrificing Life for Righteousness: The Cognitive Neural Mechanisms of Protected Values Resisting Trade-Offs

The most significant human needs derive from two sources: survival requirements and material interests. The former ensures life continuation, while the latter enables development. Based on profit-maximizing principles, avoiding death threats and obtaining material rewards represent optimal choices for biological self-preservation. However, protected values enable people to resist material temptations and even sacrifice their lives for beliefs—the essence of "sacrificing life for righteousness." As discussed, protected values maintain stability through unique representation and construction patterns, but how does this psychological structure resist material temptation and death threats? Recent cognitive neuroscience research has explored these two aspects, offering new perspectives on protected values' operating principles and internal mechanisms.

3.1 How Protected Values Resist Material Temptation

A defining characteristic of protected values is non-tradability—individuals refuse to abandon their values regardless of material compensation. This stems partly from absolute-rule-based construction and partly from emotional counter-responses triggered by value violations—the aforementioned "backfire effect." Dogan et al. (2016) used "integrity" as a representative protected value to examine resistance to monetary temptation. Participants role-played as CEOs choosing between honestly reporting company earnings or inflating them for personal wealth. Imaging results showed that stronger endorsement of integrity as a protected value correlated with greater activation in dorsolateral prefrontal cortex (dlPFC), dorsomedial prefrontal cortex (dmPFC), and inferior frontal gyrus (IFG) when facing monetary temptation. Further analyses revealed that stronger unidirectional connectivity from IFG to dlPFC and bidirectional connectivity between IFG and dmPFC predicted weaker intentions to trade integrity for monetary gain. Since dlPFC, dmPFC, and IFG are involved in cognitive control and response inhibition (Aron, 2007; Carter & Veen, 2007), these findings suggest individuals who value integrity possess stronger cognitive control to suppress monetary temptation. IFG activation, previously linked to semantic rule representation (Souza, Donohue, & Bunge, 2009), may indicate more robust semantic rule networks for integrity-related beliefs. This suggests that absolute-rule-based cognition and active inhibition enable individuals to maintain protected values under monetary temptation.

Duc et al. (2013) investigated the "backfire effect" and its neural correlates when protected values were forced into trade-offs. Economics and theology students performed tasks trading human life against monetary compensation. Theology students, more likely to view life as a protected value, reported higher levels

of anger and disgust, showing greater activation in right amygdala and anterior temporal lobe (aTL). Stronger connectivity within the medial prefrontal-temporal-limbic network and between amygdala and this network correlated with higher self-reported negative emotion. Given previous findings, enhanced amygdala and fronto-temporal-limbic network activity may reflect stronger emotional attention following trade-off decisions, while aTL activation may represent complex perceptual processes of violated moral rules (Zahn et al., 2007). These results demonstrate that negative emotional experiences elicited by rule violations may be crucial for protected values to resist monetary temptation and maintain their legitimacy.

In summary, although direct neurophysiological research on protected values resisting material temptation remains limited, combining the aforementioned representation and construction patterns allows speculation about the underlying mechanisms. First, protected values are constructed as deontological absolute rules, enabling them to bypass cost-benefit calculations and directly extract relevant rules from semantic memory networks for compliance and judgment. Second, because protected value representation and construction involve self and moral identity, forcing choices between values and monetary interests may be perceived as threats to self and moral identity, triggering angry and disgusted emotional responses that reinforce original beliefs.

3.2 How Protected Values Transcend the Survival Instinct

For organisms, death avoidance represents the optimal value choice. Yet many individuals sacrifice their lives for value beliefs, most commonly observed in religious groups that provide convenient sampling populations. Recent research has revealed the psychological processes underlying why religious extremist group members or supporters sacrifice their lives for protected values.

Studies show that when religious extremist group members face choices between protected values and life sacrifice, absolute-rule processing predominates while cost-benefit calculation is minimized. For example, Pretus et al. (2018) studied young Moroccan-origin men in Barcelona who publicly declared willingness to sacrifice their lives for jihad, making religious doctrine their protected value. During brain scanning, participants rated their willingness to fight or die for protected values (e.g., prohibiting cartoons about prophets, banning same-sex marriage) versus important but non-protected values (e.g., women wearing veils, Islamic teaching in schools). Behaviorally, participants reported stronger willingness to fight and sacrifice for protected values. Neurally, protected values more strongly activated IFG, a region associated with semantic rule extraction and processing, indicating that protected values function as absolute rules in these individuals' cognitive structures, maintained as inviolable even when facing death.

Hamid et al. (2019) recruited religious fanatics among Pakistani immigrants in Spain, all supporters of Lashkar-e-Taiba, who held extreme positions on religion-

related values. When presented with protected and non-protected values and asked to report willingness to fight or die for them, protected values showed weaker activation in dorsolateral prefrontal cortex (dlPFC) compared to non-protected values. Since dlPFC is involved in executive control functions such as cost-benefit evaluation of external stimuli (Rudorf & Hare, 2014) and calculation of gains and losses (Hare, Camerer, & Rangel, 2009), Hamid et al. (2019) concluded that when choosing to sacrifice life for protected values, individuals engage in less cost-benefit calculation and instead treat protected values as moral imperatives guiding their goals.

Pretus et al. (2019) provided further insights by recruiting Pakistani Muslim immigrants in Barcelona and identifying staunch supporters of jihadist and nationalist causes as representative of extreme protected values. Participants evaluated statements like "Western armies should be expelled from Muslim countries" and "India cannot have sovereignty over Kashmir," rating their willingness to fight or die on a 7-point Likert scale. Results showed that higher willingness to fight and die correlated with stronger ventromedial prefrontal cortex (vmPFC) activity and weaker dlPFC activation, with less pronounced functional connectivity between these regions. As previously noted, vmPFC is associated with subjective value assignment in decision-making (Bartra et al., 2013; Shenhav & Greene, 2014), while dlPFC is linked to deliberative reasoning and cost-benefit integration. This suggests that extremists subjectively assign supreme value to sacrificing life for beliefs, rendering cost-benefit calculation and cognitive control pathways largely inactive. As a control, Pretus et al. (2019) exposed participants to peers' low willingness to fight and die, observing increased dlPFC activity accompanying reduced self-reported willingness to sacrifice life for beliefs. These findings indicate an antagonistic relationship between subjective valuation and cost-benefit calculation systems.

In conclusion, the ability of certain religion-related protected values to transcend the survival instinct appears intimately linked to their unique representation and construction patterns. On one hand, as absolute deontological rules, protected values remain the primary choice even when facing potential sacrifice for beliefs, bypassing cost-benefit deliberation. On the other hand, the representational alignment between protected values and self-moral identity establishes them as supreme value goals in individuals' lives, making it difficult for cost-benefit calculation systems to operate.

4. Summary and Future Directions

Throughout human history, behaviors of remaining "unswayed by wealth and power, unyielding to poverty and hardship, and unbent by force" for the sake of ideals have been widely admired across cultures. Such actions transcend biological self-preservation instincts, representing a unique aspect of human psychology. Recent research on the cognitive neural mechanisms of protected values has provided neurophysiological evidence for understanding the psychological processes behind "sacrificing life for righteousness." Current findings suggest that people

can resist material temptation or sacrifice life for cherished beliefs because protected values are represented and constructed as deontological absolute rules, requiring compliance rather than cost-benefit deliberation. Additionally, their close connection to self and moral identity processes subjectively assigns them supreme value, and forcing them into cost-benefit calculations triggers angry emotional responses that further strengthen commitment. Overall, research in this area is in its infancy, and future studies should address several key issues.

First, the neural mechanisms of protected values require further clarification. Future research can proceed along two paths: static structure and dynamic processing. On one hand, previous studies have identified stable neural foundations for values, manifested in spontaneous brain activity and even structural levels (Zacharopoulos et al., 2017; Zacharopoulos, Lancaster, Bracht, Ihssen, Maio, & Linden, 2016). Given that protected values represent particularly stable psychological structures, exploring their manifestation in resting-state and structural brain states could provide novel perspectives and evidence. On the other hand, as discussed, protected values' resistance to trade-offs may result from interactions between "cold" cognitive rule systems and "hot" subjective valuation and emotional arousal systems—the former providing direct value selection, the latter helping individuals ignore practical interests through self-identity and moral emotions. However, these are inferences based on existing results; the specific relationships and operating modes between these processing systems warrant further investigation. Examining both static structure and dynamic processing will deepen understanding of protected values' neural mechanisms.

Second, protected values must be investigated within Chinese cultural and social contexts. Most current research has been conducted in Western cultural settings. Kaplan et al. (2016a) performed cross-cultural comparisons among Iranian, American, and Chinese participants, finding that Chinese participants showed the smallest brain activation differences between protected and non-protected values, possibly due to East Asian cultures' emphasis on dialectical thinking and context-dependent self-construal. However, this conclusion likely reflects cultural differences. Protected values originated from "sacred values" in religious contexts, making it difficult for predominantly atheist Chinese participants to exhibit the same protected value processing tendencies as Iranian and American participants. Nevertheless, Chinese culture is not lacking in commitment to beliefs and righteousness, as exemplified by ancient Confucian intellectuals and modern revolutionary martyrs. This suggests that protected values as conceptualized in Western research frameworks—especially religion-related ones—may differ in both content and mechanisms from those that have sustained Chinese individuals throughout history. Therefore, research confined to Western protected value contexts may be problematic. Future studies should re-examine the content and mechanisms of protected values through deeper understanding of Chinese culture and contemporary social development, drawing on foreign research findings.

Finally, scientifically grounded intervention and guidance practices for protected

values require development. Current findings suggest protected values function as a double-edged sword. On one hand, protected values held by ethnic and religious extremists underlie radical behaviors, and their unique processing characteristics make these extreme ideologies particularly resistant to change—further strengthened by social rejection and isolation (Pretus et al., 2018). On the other hand, cultivating and practicing core socialist values such as "integrity" and "patriotism" to become nationally recognized and upheld protected values that guide education, spiritual civilization, and social development remains a long-term concern for educators. How can educational practice employ effective propaganda and intervention to prevent negative extreme protected values from fueling radical behaviors while enhancing positive protected values' role in behavior shaping and social mentality guidance? This represents an important applied research topic. Future research should clarify differences in mechanisms between extreme protected values (negative) and those upholding truth and justice (positive), identify possible hierarchies of protected values, and deeply examine their formation processes and developmental patterns to provide theoretical support for cultivating proper values in practice.

References

He, G., & Xi, Y. (2005). Protected values and their impact on decision-making behavior. *Applied Psychology*, *11*(1), 60-66.

Huang, X. (2014). *Exploring the Mysteries of Personality*. Beijing: The Commercial Press.

Li, L., & Huang, X. (2013). The neural mechanisms of values: Another research perspective. *Advances in Psychological Science*, *21*(8), 1400-1407.

Aron, A. R. (2007). The neural basis of inhibition in cognitive control. *The Neuroscientist*, *13*(3), 214-228.

Atran, S., & Ginges, J. (2012). Religious and sacred imperatives in human conflict. *Science*, *336*(6083), 855-857.

Baron, J. (2009). Belief overkill in political judgments. *Ssrn Electronic Journal*, *29*(4), 368-378.

Baron, J., & Spranca, M. (1997). Protected values. *Organizational Behavior & Human Decision Processes*, *70*(1), 1-16.

Baron, & Jonathan. (2017). Protected values and other types of values. *Analyse & Kritik*, *39*(1), 59-78.

Bartra, O., Mcguire, J. T., & Kable, J. W. (2013). The valuation system: A coordinate-based meta-analysis of bold fmri experiments examining the neural correlates of subjective value. *NeuroImage*, *76*, 412-427.

Berns, G. S., Bell, E., Capra, C. M., Prietula, M. J., Moore, S., Anderson, B., ··· Atran, S. (2012). The price of your soul: Neural evidence for the non-utilitarian

representation of sacred values. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *367*, 754–762.

Berns, G. S., Prietula, M., & Lemieux, A. F. (2012). Neurobiology of sacred values and implications for radicalization process. In *National Security Challenges: Insights from Social, Neurobiological, and Complexity Sciences*, *28*, 164–172.

Bénabou, R., & Tirole, J. (2011). Identity, morals, and taboos: Beliefs as assets. *The Quarterly Journal of Economics*, *126*(2), 805–855.

Bhanji, J. P., Beer, J. S., & Bunge, S. A. (2010). Dissociable prefrontal systems implicated in probabilistic versus deterministic rule-based decisions. *NeuroImage*, *49*(2), 1810–1819.

Carter, C. S., & Van Veen, V. (2007). Anterior cingulate cortex and conflict detection: An update of theory and data. *Cognitive, Affective, & Behavioral Neuroscience*, *7*(4), 367–379.

Cooper, N., Bassett, D. S., & Falk, E. B. (2017). Coherent activity between brain regions that code for value is linked to the malleability of human behavior. *Scientific Reports*, *7*, 43250.

Dogan, A., Morishima, Y., Heise, F., Tanner, C., Gibson, R., Wagner, A. F., & Tobler, P. N. (2016). Prefrontal connections express individual differences in intrinsic resistance to trading off honesty values against economic benefits. *Scientific Reports*, *6*(1), 33263–33263.

Duc, C., Hanselmann, M., Boesiger, P., & Tanner, C. (2013). Sacred values: Trade-off type matters. *Journal of Neuroscience, Psychology, and Economics*, *6*(4), 252–263.

Ginges, J., Atran, S., Medin, D., & Shikaki, K. (2007). Sacred bounds on rational resolution of violent political conflict. *Proceedings of the National Academy of Sciences*, *104*, 7357–7360.

Hamid, N., Pretus, C., Atran, S., Crockett, M. J., Ginges, J., Sheikh, H., ⋯ & Vilarroya, O. (2019). Neuroimaging 'will to fight' for sacred values: An empirical case study with supporters of an Al Qaeda associate. *Royal Society Open Science*, *6*(6).

Hanselmann, M., & Tanner, C. (2008). Taboos and conflicts in decision making: Sacred values, decision difficulty, and emotions. *Judgment and Decision Making*, *3*, 51–63.

Hare, T. A., Camerer, C. F., & Rangel, A. (2009). Self-control in decision-making involves modulation of the vmPFC valuation system. *Science*, *324*(5927), 646–648.

Hitlin, S., & Piliavin, J. A. (2004). Values: Reviving a dormant concept. *Annual Review of Sociology*, *30*(1), 359–393.

Kable, J. W., & Glimcher, P. W. (2009). The neurobiology of decision: Consensus and controversy. *Neuron*, *63*(6), 733–745.

Kaplan, J. T., Gimbel, S. I., Dehghani, M., Immordinoyang, M. H., Sagae, K., Wong, J. D., ···& Damasio, A. R. (2016a). Processing narratives concerning protected values: A cross-cultural investigation of neural correlates. *Cerebral Cortex*, *27*(2), 1428–1438.

Kaplan, J. T., Gimbel, S. I., & Harris, S. (2016b). Neural correlates of maintaining one' s political beliefs in the face of counterevidence. *Scientific Reports*, *6*(1).

Levy, D. J., & Glimcher, P. W. (2012). The root of all value: A neural common currency for choice. *Current Opinion in Neurobiology*, *22*(6), 1027–1038.

McNamee, D., Rangel, A., O' Doherty, J.P. (2013). Category-dependent and category-independent goal-value codes in human ventromedial prefrontal cortex. *Nature Neuroscience*, *16*(4), 479–485.

Nook, E. C., & Zaki, J. (2015). Social norms shift behavioral and neural responses to foods. *Journal of Cognitive Neuroscience*, *27*(7), 1412–1426.

Pincus, M., Laviers, L., Prietula, M. J., & Berns, G. S. (2014). The conforming brain and deontological resolve. *Plos One*, *9*(8), e106061.

Pretus, C., Hamid, N., Sheikh, H., Ginges, J., Tobeña, A., & Davis, R., et al. (2018). Neural and behavioral correlates of sacred values and vulnerability to violent extremism. *Frontiers in Psychology*, *9*: 2462.

Pretus, C., Hamid, N., Sheikh, H., Gomez, A., Ginges, J., Tobena, A., ···& Atran, S. (2019). Ventromedial and dorsolateral prefrontal interactions underlie will to fight and die for a cause. *Social Cognitive and Affective Neuroscience*, *14*(6), 569–577.

Rudorf, S., & Hare, T. A. (2014). Interactions between dorsolateral and ventromedial prefrontal cortex underlie context-dependent stimulus valuation in goal-directed choice. *The Journal of Neuroscience*, *34*(48), 15988–15996.

Sandel, M. (2012). *What Money Can' t Buy: The Moral Limits of Markets*. New York: Farrar, Straus and Giroux.

Sharot, T., Kanai, R., Marston, D., Korn, C. W., Rees, G., & Dolan, R. J. (2012). Selectively altering belief formation in the human brain. *Proceedings of the National Academy of Sciences*, *109*(42), 17058–17062.

Sheikh, H., Ginges, J., Coman, A., & Atran, S. (2012). Religion, group threat and sacred values. *Judgment and Decision Making*, *7*(2), 110–118.

Sheikh, H., Gómez, Á., Atran, S. (2016). Empirical evidence for the devoted actor model. *Current Anthropology*, *57*, S204–209.

Shenhav, A., Greene, J.D. (2014). Integrative moral judgment: Dissociating the roles of the amygdala and ventromedial prefrontal cortex. *The Journal of*

Neuroscience, *34*, 4741–4749.

Souza, M. J., Donohue, S. E., & Bunge, S. A. (2009). Controlled retrieval and selection of action-relevant knowledge mediated by partially overlapping regions in left ventrolateral prefrontal cortex. *Neuroimage*, *46*(1), 299–307.

Tanner, C. (2009). To act or not to act: Nonconsequentialism in environmental decision-making. *Ethics & Behavior*, *19*, 479–495.

Vilarroya, O., & Hilferty, J. (2013). The neuroimaging of sacred values. *Annals of the New York Academy of Sciences*, *1299*, 25–35.

Zahn, R., Moll, J., Krueger, F., Huey, E. D., Garrido, G., & Grafman, J. (2007). Social concepts are represented in the superior anterior temporal cortex. *Proceedings of the National Academy of Sciences*, *104*(15), 6430–6435.

Zacharopoulos, G., Hanel, P. H., Lancaster, T. M., Ihssen, N., Drakesmith, M., Foley, S., ···& Linden, D. E. (2017). Nonlinear associations between human values and neuroanatomy. *Social Neuroscience*, *12*(6), 673–684.

Zacharopoulos, G., Lancaster, T. M., Bracht, T., Ihssen, N., Maio, G. R., & Linden, D. E. (2016). The hedonism hub in the human brain. *Cerebral Cortex*, *26*(10), 3921–3927.

Note: Figure translations are in progress. See original paper for figures.