

The Involuntary Nature of Belief: Exploring Cognitive, Social, Neurological, and Computational Perspectives

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Abstract. Faith, as a powerful guiding force in our daily lives, means that individuals or groups accept certain statements as true. The debate over whether faith is voluntary or involuntary continues. This article attempts to demonstrate that all faith is inherently involuntary, challenging the notion of voluntary faith. Shed light on the involuntary nature of beliefs by exploring belief formation from a cognitive and social perspective, and the role of neural and computational mechanisms in decision making, and highlight the complex interplay between cognitive processes, social influences, and neural mechanisms that shape our beliefs.

Keywords: faith; voluntary; cognitive processes; social perspective; neural mechanisms.

1. Introduction

Stereotypes depicted in Western media, such as portraying Asians as nerdy math experts and predominantly male characters as skilled agents, serve as glaring examples of the prevailing inaccurate and biased beliefs in society. Despite individuals explicitly disavowing prejudice, recent studies on discrimination reveal the persistence of these implicit stereotypes (Greenwald & Banaji, 1995). The Implicit Association Test conducted by Harvard University further illuminates the subconscious association of negative adjectives with African Americans, even among individuals who deny explicit bias. This prompts us to question the origin of these beliefs and whether they are consciously chosen. Belief, as a powerful guiding force in our daily lives, signifies the acceptance of certain statements as true by individuals or groups (Schwitzgebel, 2021). The debate about whether beliefs are involuntary or voluntary remains ongoing. Involuntary beliefs can be understood as the inevitable and uncontrollable outcomes of developing attitudes, while voluntary beliefs may be reflected in the decision-making process where individuals carefully evaluate multiple options, weighing the pros and cons of each possibility. This essay seeks to demonstrate that all beliefs can be inherently involuntary, challenging the notion of voluntary beliefs. Through an exploration of belief formation from cognitive and social perspectives, as well as an examination of the role of neural and computational mechanisms in decision-making, we aim to shed light on the involuntary nature of belief.

2. Cognitive Perspective

The formation of beliefs is the result of collaborative functioning of multiple cognitive abilities. Influenced by multiple factors, beliefs can be easily manipulated and unconsciously altered both in the long and short term. One aspect to consider is the susceptibility of human memory to manipulation, resulting in false beliefs. Memory serves as a reconstructive process, summarizing past experiences to aid in predicting the future (Hassabis & Maguire, 2007; Roediger & McDermott, 1995). Thus, it is not a precise record and can be easily contaminated by external information, leading to involuntary changes in one's beliefs. A study by Laney et al. (2008) exemplifies this phenomenon by providing participants with a false food profile, falsely indicating that they loved asparagus as a child. The experimental group, exposed to this false information, demonstrated a significantly higher preference for asparagus and a higher-confident belief that they loved asparagus during childhood, compared to the control group. This suggests that memories are reconstructive and susceptible to contamination, leading to the formation of false beliefs. The ease with which beliefs can be implanted or manipulated in this manner further supports the notion that they are involuntarily formed.

Moreover, not only such long-formed beliefs, but the immediate beliefs can also be unconsciously formed by cognitive processes, priming. Priming refers to the effect whereby exposure to a specific stimulus leads to changes in beliefs without the individual's awareness. Magicians often employ priming techniques to influence people's choices in magic tricks. For example, participants were shown a video in which a magician performed gestures of a diamond suit and the number three. Subsequently, participants were asked to choose a card, and the results showed that the three of diamonds were the most commonly chosen card (Pailhès & Kuhn, 2020). This demonstrates that the gesture priming employed by the magician unconsciously influenced the participants' choices, highlighting the involuntary nature of belief formation through priming. Moreover, during the 2008 United States presidential election, an experiment revealed that exposure to the American flag significantly shifted participants' voting intentions towards the Republican party (Carter et al., 2011). The American flag served as a priming stimulus, invoking Republican attitudes and beliefs, effectively altering participants' political beliefs. This finding indicates that unconscious priming can lead individuals to change their beliefs. Thus, through priming, beliefs may be unconsciously formed or modified, further supporting the argument that belief formation is predominantly involuntary.

3. Social Perspective

Social influence, as a significant contributing factor in the development of cognitive functions, can also affect the formation of individuals' beliefs and attitudes. One manifestation of social influence is observed through social learning, whereby individuals acquire knowledge by imitating the behaviours of others (Bandura & Walters, 1977). Through this process, socially accepted rules and norms are conveyed, gradually becoming integrated into one's personality and forming their own beliefs (Bales & Parsons, 1956). For instance, in a classic experiment, children who observed a role model exhibiting aggressive behaviour towards a bobo doll were more likely to imitate such actions when placed in a different room without the role model's presence (Bandura et al., 1961). This experiment demonstrated how children internalize and accept aggressive interactions as normal based on their social learning experiences. Similarly, this effect can be observed under modern context. A meta-analysis showed that being exposed to violent video games can lead to increased aggressive behavior and aggressive cognition such that children believe it is acceptable and appropriate to treat others in such hostile manner (Anderson et al., 2010). Thus, even the interactions with online entertainment platforms can unconsciously shape their beliefs towards the world and others.

Furthermore, parents employ operant conditioning to guide children's beliefs, reinforcing socially acceptable behaviours through praise and rewards while discouraging deviant actions through punishment (Gamzu, 2022). In this process, children's understanding of "right" and "wrong" beliefs develops involuntarily, as they passively receive the instilled norms and values from their parents. According to Piaget's cognitive development theory, children lack the cognitive capacity for logical and critical thinking until around the age of 12 (Piaget, 2003). Consequently, their ability to independently evaluate received information from others is limited, and their early beliefs are primarily socially constructed with minimal self-volition.

However, even for adults capable of autonomous judgment, social factors continue to shape their beliefs. Social pressure, exemplified by peer pressure, exerts influence on individuals, compelling them to conform to group norms to gain acceptance. In early human evolution, group inclusion enhanced survival and reproductive prospects, as being part of a group providing access to resources and protection against predators (Aronson, 2018). The intrinsic need for social acceptance and belonging has become deeply ingrained in human nature. When individuals desire acceptance from their peers or social groups, they may feel compelled to align their beliefs and behaviours with the majority. A study by Asch (1956) demonstrated this tendency, where participants were likely to conform to the majority's opinion, even if they knew it to be incorrect, during a vision test conducted in a group setting. Extrapolating this finding to a broader social context, it suggests that individuals readily adjust their attitudes or opinions to align with their peers in order to fit into the social group.

Through repeated conformity to the majority's views and perspectives, individuals gradually internalize the understanding of normality based on the behaviours and opinions of the majority. Thus, within such social contexts, people may involuntarily modify their beliefs as a means of conforming to the social group.

4. Neurological and Computational Perspective

The existence of voluntary beliefs is often attributed to individuals' belief in their capacity to make decisions freely through volition. However, decision-making is inherently driven by neurological and computational processes aimed at maximizing the rewards individuals can obtain and executed automatically. Brain activity plays a crucial role in representing and comparing the values of rewards, thereby guiding the decision-making process. Rewards can take both materialistic forms, such as money, and subjective forms, such as pleasure and satisfaction. They are closely related to social influence, as aforementioned, since following the group norms and being accepted by the group are highly rewarding for human beings as social animals (Aronson, 2018). Cognitive learning processes, such as operant conditioning, also play a large role in forming reward associations (Gamzu, 2022). The values of rewards are represented by the level of a neurotransmitter, dopamine, in the brain (Fiorillo, 2013). Studies using functional magnetic resonance imaging on human subjects and invasive single neuron recording on rodents demonstrated the associations between greater rewards and increased activation in the nucleus accumbens, a brain region receiving dopaminergic projections that reflect dopamine levels and predict reward values (Knutson et al., 2007; Schultz, 2002). Subsequently, the ventromedial prefrontal cortex (vmPFC) represents different options by accumulating signals of benefits from the nucleus accumbens and costs from the amygdala (Basten et al., 2010). The intraparietal sulcus then compares the signals received by the vmPFC, facilitating the final judgment. In cases where options cannot be compared directly, the orbitofrontal cortex integrates signals from different reward systems for decision-making (Bechara et al., 2000). Thus, the influence of rewards and dopamine signals in the decision-making process relegates it to autopilot mode, activating higher cognitive brain areas to compute and compare values without the involvement of voluntary beliefs.

This decision-making process can also be simulated using computational models like the drift-diffusion model (DDM). According to the DDM, individuals make decisions by gradually accumulating noisy information until reaching a specific threshold (Myers et al., 2022). By fitting the DDM to behavioural and neuroimaging data from decision-making experiments, researchers have demonstrated that the model can account for both the behavioural decisions individuals make and the neural activations measured by the blood oxygen level-dependent signal (Basten et al., 2010). These results indicate that decision-making processes, both at the behavioural and neurological levels, can be predicted and explained by computational models. Hence, decision-making can be viewed as an objective and computational process that does not necessarily require the involvement of voluntary beliefs.

5. Conclusion

In conclusion, the evidence presented from cognitive, social, and decision-making perspectives strongly suggests that belief formation is predominantly involuntary, and voluntary beliefs do not truly exist. In the cognitive realm, beliefs are affected by multiple cognitive processes and therefore can be easily manipulated and altered through memory reconstruction, false information, and unconscious priming. Human memory is susceptible to contamination, leading to the generation of false beliefs that people may not be consciously aware. Furthermore, social interactions are an indispensable factor of shaping human cognitions. Parents, role models, and peer pressure play significant roles in shaping beliefs, often leading to conformity and the acceptance of certain beliefs as "normal." Therefore, individuals can adopt and internalize widely-accepted statements and

attitudes without conscious volition. Moreover, decision-making processes are rooted in neurological and computational mechanisms driven by the pursuit of rewards, with brain activity reflecting the evaluation of options and the comparison of their values. This process occurs automatically, without the need for voluntary beliefs. Collectively, these perspectives provide compelling evidence that all beliefs are involuntarily formed, challenging the notion of voluntary beliefs and underscoring the complex interplay between cognitive processes, social influences, and neural mechanisms in shaping our beliefs.

References

- [1] Anderson, C. A., Shibuya, A., Ihori, N., Swing, E. L., Bushman, B. J., Sakamoto, A., Rothstein, H. R., & Saleem, M. (2010). Violent video game effects on aggression, empathy, and prosocial behavior in Eastern and Western countries: A meta-analytic review. *Psychological Bulletin*, 136(2), 151 – 173. <https://doi.org/10.1037/a0018251>
- [2] Aronson, E. (2018). *The social animal*. 12th ed. San Francisco, W. H. Freeman.
- [3] Asch, S. E. (1956). Studies of independence and conformity: I. A minority of one against a unanimous majority. *Psychological Monographs: General and Applied*, 70(9), 1 – 70. <https://doi.org/10.1037/h0093718>
- [4] Bales, R. F., & Parsons, T. (1956). *Family: Socialization and Interaction Process*. <https://www.taylorfrancis.com/books/edit/10.4324/9781315824307/family-socialization-interaction-process-talcot-parsons-robert-bales>
- [5] Bandura, A., Ross, D., & Ross, S. A. (1961). Transmission of aggression through imitation of aggressive models. *The Journal of Abnormal and Social Psychology*, 63(3), 575 – 582. <https://doi.org/10.1037/h0045925>
- [6] Basten, U., Biele, G., Heekeren, H. R., & Fiebach, C. J. (2010). How the brain integrates costs and benefits during decision making. *Proceedings of the National Academy of Sciences*, 107(50), 21767 – 21772. <https://doi.org/10.1073/pnas.0908104107>
- [7] Bechara, A., Damasio, H., & Damasio, A. R. (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral Cortex*, 10(3), 295 – 307. <https://doi.org/10.1093/cercor/10.3.295>
- [8] Bandura, A., & Walters, R. H. (1977). *Social learning theory* (Vol. 1). Prentice Hall: Englewood cliffs.
- [9] Carter, T. J., Ferguson, M. J., & Hassin, R. R. (2011). A single exposure to the American flag shifts support toward Republicanism up to 8 months later. *Psychological Science*, 22(8), 1011 – 1018. <https://doi.org/10.1177/0956797611414726>
- [10] Fiorillo, C. D. (2013). Two dimensions of value: dopamine neurons represent reward but not aversiveness. *Science*, 341(6145), 546 – 549. <https://doi.org/10.1126/science.1238699>
- [11] Gamzu, B. S., Elkan. (2022). Pavlovian control of operant behavior: an analysis of autoshaping and its implications for operant conditioning*. In *Handbook of Operant Behavior*. Routledge.
- [12] Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, 102(1), 4 – 27. <https://doi.org/10.1037/0033-295X.102.1.4>
- [13] Hassabis, D., & Maguire, E. A. (2007). Deconstructing episodic memory with construction. *Trends in Cognitive Sciences*, 11(7), 299 – 306. <https://doi.org/10.1016/j.tics.2007.05.001>
- [14] Knutson, B., Rick, S., Wimmer, G. E., Prelec, D., & Loewenstein, G. (2007). Neural predictors of purchases. *Neuron*, 53(1), 147 – 156. <https://doi.org/10.1016/j.neuron.2006.11.010>
- [15] Laney, C., Morris, E. K., Bernstein, D. M., Wakefield, B. M., & Loftus, E. F. (2008). Asparagus, a love story. *Experimental Psychology*, 55(5), 291 – 300. <https://doi.org/10.1027/1618-3169.55.5.291>
- [16] Myers, C. E., Interian, A., & Moustafa, A. A. (2022). A practical introduction to using the drift diffusion model of decision-making in cognitive psychology, neuroscience, and health sciences. *Frontiers in Psychology*, 13.

- [17] Pailhès, A., & Kuhn, G. (2020). Influencing choices with conversational primes: How a magic trick unconsciously influences card choices. *Proceedings of the National Academy of Sciences*, 117(30), 17675 – 17679. <https://doi.org/10.1073/pnas.2000682117>
- [18] Piaget, J. (2003). Part I: cognitive development in children--piaget development and learning. *Journal of Research in Science Teaching*, 40. <https://eric.ed.gov/?id=ej773455>
- [19] Roediger, H. L., & McDermott, K. B. (1995). Creating false memories: remembering words not presented in lists.
- [20] Schultz, W. (2002). getting formal with dopamine and reward. *Neuron*, 36(2), 241 – 263. [https://doi.org/10.1016/S0896-6273\(02\)00967-4](https://doi.org/10.1016/S0896-6273(02)00967-4)
- [21] Schwitzgebel, E. (2021). Belief. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Winter 2021). Metaphysics Research Lab, Stanford University.