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# FREE WILL IN THE HUMAN MIND: MYTH OR REALITY?

***Shahnawaz Ahmed**

Department of Ecotoxicology Institute for Industrial Research and Toxicology, Ghaziabad, Uttar Pradesh, India 201302.

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***Corresponding Author: Shahnawaz Ahmed**

Department of Ecotoxicology Institute for Industrial Research and Toxicology, Ghaziabad, Uttar Pradesh, India 201302.
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## ABSTRACT

The question of whether free will truly exists in the human mind is still a major debate in philosophy, neuroscience, and psychology. Free will is usually understood as the ability to make choices that are not fully controlled by outside forces. Philosophers often see this issue in three ways. Determinism says that everything is caused by prior events, so our choices are not really free. Libertarianism argues the opposite—that people can act with full independence. Compatibilism tries to find a middle ground, suggesting that we can still make meaningful choices even within a world shaped by cause and effect. Neuroscience adds more complexity. Experiments, like those of Benjamin Libet, show that brain activity begins before we become aware of making a decision. This raises doubts about whether conscious control comes first. Still, the brain's ability to adapt and change (neuroplasticity) suggests that we do have some influence over our actions. Psychology also shows that our choices are shaped by hidden factors—like unconscious processes, genetics, environment, and cognitive biases. This challenges the idea of complete freedom. Yet, believing in free will still plays an important role. It supports responsibility, motivation, and social order. Some newer approaches, such as "probabilistic free will" or compatibilist models, argue that our freedom lies within limits—we may not have absolute independence, but we do have room to choose. Future studies in neuroscience and artificial intelligence may help us understand this better. For now, it seems free will is not unlimited, but it still matters in how we live, make decisions, and take responsibility.

**KEYWORDS:** Free will, determinism, compatibilism, neuroscience, autonomy, psychology, responsibility

## INTRODUCTION

Whether humans genuinely make free choices—or simply experience the feeling of deciding while the brain works behind the scenes—has shifted from a purely philosophical puzzle to an active research program in neuroscience, psychology, genetics, and law. Philosophers have long outlined three main views: hard determinism denies real alternatives, libertarianism defends genuine agent-driven choice, and compatibilism redefines freedom as acting in line with one's reasons under the right kinds of control. A major compatibilist move, introduced by Frankfurt, even challenges the idea that moral responsibility requires the ability to do otherwise, arguing instead that responsibility depends on whether an action flows from the agent's own will and higher-order commitments [1].

Neuroscientific studies have pushed this debate further by examining how decisions unfold relative to conscious awareness. Libet's classic experiments showed that a premotor "readiness potential" appears in the brain hundreds of milliseconds before participants report deciding, suggesting that neural activity precedes awareness [2],[3]. Later fMRI work extended this timeline, showing that patterns in the frontopolar and parietal cortex can predict, with above-chance accuracy, a person's choice up to seven seconds before conscious report [4],[5]. Such findings are often seen as a threat to libertarian free will, though interpretations differ. For example, the accumulator model proposes that the readiness potential might reflect random neural fluctuations reaching a threshold rather than a programmed decision, softening the claim that brain signals fully determine action [6].

Psychological research also challenges the authority of introspection. In "choice blindness" experiments, people often fail to notice when their chosen option is secretly switched, yet still provide confident explanations for the outcome they never actually selected [7]. This shows how easily the mind invents justifications after the fact. More broadly, Wegner suggested that the sense of conscious will may itself be an inference rather than direct evidence of control, cautioning against treating introspective reports as proof of true freedom [8].


At the same time, recognizing causal influences does not make human agency meaningless. Research in behavioral genetics shows that many human traits are strongly heritable, with a meta-analytic average of about 49%, highlighting that self-control and related capacities are shaped by both genes and environment rather than existing as unconstrained "uncaused causes" [9]. Legal theory, increasingly influenced by neuroscience, also reflects this view. Even if neural determinants are everywhere, the practices of responsibility and punishment need not disappear; instead, they can be reframed around goals such as deterrence, rehabilitation, and reinforcing social norms [10].

Taken together, these insights suggest a more nuanced perspective. Human choice is embedded in causal processes and partly predictable, and our introspection about decisions is often unreliable. Still, meaningful control can survive in compatibilist forms that emphasize responsiveness to reasons, self-regulation, and the ability to revise one's values and policies over time. In short, science has not decisively disproven free will. What it has done is narrow the field, showing that the real question is not whether choices have causes—they clearly do—but whether the mechanisms behind intention and decision-making can support the kinds of agency that matter for explanation, ethics, and law.

## 2. Philosophical and Logical Foundations

The debate over free will long predates neuroscience, with roots reaching back to classical philosophy. At its heart is the conflict between determinism—the idea that all events, including human actions, follow necessarily from prior causes—and libertarianism, which claims that genuine freedom requires actions not fully determined by what came before [14]. Aristotle's account of voluntary action highlighted this link, tying moral responsibility to an agent's capacity for rational deliberation [15].

### 2.1 Determinism vs. Libertarianism

Determinism found strong expression in early modern philosophy and physics. Laplace's demon famously illustrated this worldview: a hypothetical intellect that, knowing every physical law and initial condition, could predict the future with certainty [16]. In contrast, libertarian thinkers such as Roderick Chisholm argued for agent causation, the idea that individuals themselves originate actions as ultimate causes, not reducible to prior events [17].

### 2.2 Compatibilism

Compatibilism offers a middle ground, holding that free will and determinism can coexist. Here, freedom is not independence from causality but rather the ability to act on one's reasons and desires without external coercion [18]. David Hume, for instance, argued that liberty and necessity are not contradictory but complementary in explaining human action [19]. More recently, John Martin Fischer and Mark Ravizza have developed a "reasons-responsive" model of agency, which sees freedom as the capacity to recognize and respond to rational considerations even in a deterministic world [20].

### 2.3 Logical Paradoxes

Philosophical reflection also exposes paradoxes. The infinite regress problem suggests that if each choice requires validation by a prior choice, ultimate freedom becomes impossible. Another puzzle, the responsibility dilemma, asks: if actions are determined, how can people be morally accountable? Frankfurt's challenge to the "principle of alternate possibilities" offers a response. He argued that responsibility does not require the ability to do otherwise but depends on whether actions flow from the agent's own will [21]. This compatibilist insight reshapes the debate, showing how meaningful responsibility might still exist in a determined universe.

## 3. Neuroscientific Evidence

Over the past four decades, neuroscience has transformed the free will debate from a primarily philosophical discussion into an empirical question about the timing and mechanisms of decision-making. Brain imaging, electrophysiology, and computational modeling have revealed that the neural processes leading to an action often begin before conscious awareness of the decision.

### 3.1 Brain Activity Preceding Conscious Decisions

Benjamin Libet's experiments in the early 1980s remain the cornerstone of neuroscientific discussions of free will. Using electroencephalography (EEG), Libet observed a readiness potential—a slow buildup of neural activity in the motor cortex—beginning about 300–500 ms before participants reported their conscious intention to move [22]. This suggested that unconscious neural processes initiate action before conscious volition arises.

Subsequent work extended these findings. Soon et al. employed functional magnetic resonance imaging (fMRI) and multivariate pattern analysis to predict whether participants would press a left or right button. Strikingly, their results showed predictive brain activity in frontopolar and parietal cortices up to 7 seconds before subjects reported their choice [23]. This raised profound questions about the autonomy of conscious decision-making.

### 3.2 Role of Neural Networks

Neuroscientific evidence increasingly suggests that decision-making is an emergent property of distributed neural networks. Rather than being the product of a single locus of volition, choices emerge from interactions between cortical and subcortical systems, such as the prefrontal cortex, basal ganglia, and parietal regions [24]. The influence of unconscious biases, habitual pathways, and reinforcement histories all shape the final outcome, challenging simplistic models of an uncaused "free" decision.

### 3.3 Neuroplasticity and Conscious Override

However, neuroscience also provides evidence for partial autonomy. Research on neuroplasticity demonstrates that conscious training and deliberate practice can rewire neural pathways, strengthen self-control and inhibit impulsive responses [25]. Studies on mindfulness and cognitive reappraisal suggest that intentional mental effort recruits prefrontal networks that override default neural impulses [26]. This indicates that while unconscious neural dynamics are powerful, conscious regulation exerts meaningful top-down influence.

## 4. Psychological and Cognitive Factors Affecting Free Will

The perception of free will is the feeling that we are making choices on our own and controlling our actions. Psychological and cognitive factors—both conscious and unconscious—play a central role in shaping this experience. They influence how people interpret their own decisions, whether they feel genuinely autonomous, or whether they sense

their choices are shaped by outside pressures or hidden mental processes. Put simply, these are the ways our minds and brains affect the sense that we are acting freely.

### 4.1 Key Factors Influencing Perceived Free Will (Rated out of 10)

1. **Illusion of Conscious Control (8/10):** People often believe they consciously initiate their actions, but research suggests many decisions start in the brain before awareness kicks in. Daniel Wegner argued that the sense of willing an action is sometimes a post-hoc story: the brain acts first, and consciousness interprets it afterward. Example: A pianist playing a familiar piece moves their fingers automatically yet still feels they are choosing each note [27].
2. **Choice Blindness (7/10):** Studies show that people can be unaware of mistakes in their own choices. If a decision is secretly changed, they often defend the "wrong" choice as if it were their own. Example: In Johansson et al.'s experiment, participants were asked to pick the more attractive of two faces. Some choices were swapped without their knowledge, yet participants confidently explained why they preferred the swapped face [28].
3. **Environmental and Genetic Influences (9/10):** Our decisions are strongly shaped by social norms, cultural expectations, inherited traits, and situational pressures. These forces often work unconsciously. Example: A child raised in a strict household may adopt conservative habits and ways of thinking, shaped by both temperament and upbringing [29].
4. **Post-hoc Rationalization (6/10):** After making choices, people often invent reasons for why they acted a certain way, reinforcing the sense of autonomy. Example: A shopper may claim they bought a product for its quality or design, when in fact they were swayed by a discount or clever packaging [30].
5. **Cognitive Biases and Heuristics (7/10):** Decision-making relies heavily on mental shortcuts and biases, which limit flexibility but preserve the feeling of free choice. Example: An investor might buy a stock simply because they heard positive news about it recently (availability heuristic), while believing the choice was a rational calculation [30].
6. **Influence of Memory and Self-Concept (6/10):** How people remember past actions and view themselves affects their sense of control. Strong self-belief and coherent life stories boost perceived autonomy, while fragmented or externally controlled experiences weaken it. Example: A person recalling past problem-solving successes may feel free to make

bold career choices, while repeated failures or heavy outside pressure may reduce this sense of freedom [27].

7. **Neurological Foundations (8/10):** Brain studies reveal that neural activity in regions like the prefrontal and parietal cortex often begins before conscious awareness of decisions. This timing shapes whether we feel an action was freely chosen. Example: Libet's experiments showed that brain signals indicating a finger movement appeared before participants reported the intention to move [27].

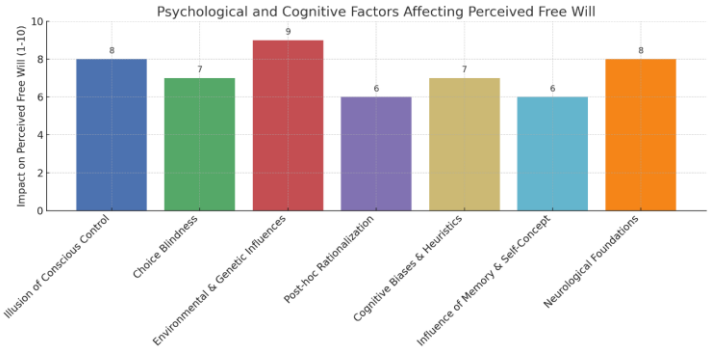
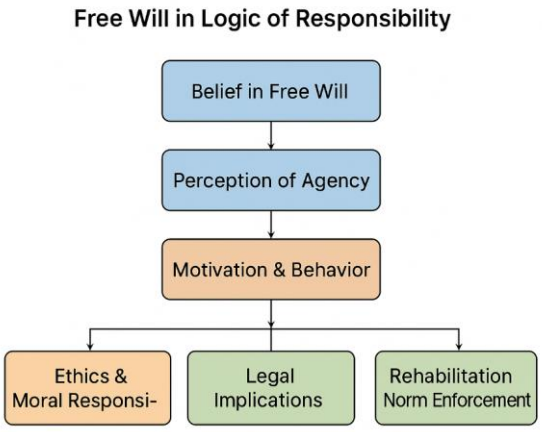



**Figure 1. The graph indicates that environmental and genetic influences (9/10) are the most dominant factors shaping our sense of free will, followed closely by the illusion of conscious control and neurological foundations (8/10).**

Post-hoc rationalization and the influence of memory and self-concept (6/10) have a more moderate effect. Choice blindness demonstrates that even confident self-perception can be inaccurate. Overall, these findings highlight that free will is not purely conscious or autonomous but emerges from a complex interplay of unconscious processes, biological predispositions, and social context.

## 5. Free Will in Logic of Responsibility



The debate over free will is not only a metaphysical issue but also a practical one. Our ethical systems, legal practices, and ideas of accountability all depend on the assumption that people can act as responsible agents. Even if neuroscience and psychology show that conscious choice is limited, societies continue to operate on the basis that individuals are morally and legally accountable.

### 5.1 Ethics and Law

Moral philosophy has long tied responsibility to free will. If every action were fully determined by prior causes, one might think moral accountability would collapse. Yet legal systems typically hold people accountable so long as they act knowingly and voluntarily, regardless of deterministic explanations [31]. Greene and Cohen argue that neuroscience will not erase responsibility but instead reshape it. Rather than justifying punishment on retributive grounds (because someone "deserves" it), law may increasingly rely on consequentialist aims like deterrence, rehabilitation, and social protection [32]. This line of thought aligns with compatibilist theories, which stress that responsibility survives as long as actions arise from a person's own reasons and values—even in a causally determined world.

### 5.2 Practical Necessity of Belief in Free Will

Psychological studies show that belief in free will has important motivational effects. When people's belief in free will is weakened, they are more likely to cheat, behave aggressively, or show reduced self-control [33]. By contrast, affirming autonomy tends to encourage prosocial behavior, perseverance, and resilience [34]. For this reason, belief in free will may be functionally indispensable, even if human thought and behavior ultimately unfold within deterministic or probabilistic systems. This pragmatic view—sometimes called the "illusion but useful" hypothesis—suggests that belief in agency itself supports both individual growth and social harmony.

## 6. Integrative Perspectives

### 6.1 Probabilistic Free Will

The traditional free will debate often contrasts determinism with human autonomy. Quantum mechanics adds another dimension, suggesting that events at the subatomic level may occur probabilistically rather than strictly deterministically. Some have proposed that this indeterminacy could contribute to free will, allowing decisions that are not entirely predetermined [40]. Additionally, neuroscientists suggest that probabilistic activity in cortical networks might influence neural decision-making, providing a potential mechanism for free

will. However, this idea is debated, as mere randomness does not automatically translate into meaningful or controlled choice [2].

### 6.2 Compatibilist Approach

Compatibilism seeks to reconcile free will with determinism. From this perspective, freedom is the ability to act according to one's reasoning and values, even if those actions are influenced by prior causes [43]. Moral and legal responsibility remain meaningful under this view, since autonomy is understood as rational self-governance rather than metaphysical independence [6].

### 6.3 Future Directions

Emerging technologies such as brain–computer interfaces (BCIs) and artificial intelligence (AI) offer new ways to study and expand human autonomy. BCIs allow people to control devices directly via neural signals, raising questions about the limits of agency [45]. Similarly, AI may shape decision-making processes, highlighting the need for ethical oversight to preserve human control and responsibility [46].

### 6.4 Ethical Implications of Neuroscientific Determinism

As neuroscience advances, our ability to predict and influence behavior challenges traditional ideas of moral responsibility. Ethical concerns include the unauthorized manipulation of neural activity and ensuring informed consent in neurotechnology applications [33]. Addressing these challenges is critical for safeguarding individual autonomy in an era of rapid technological progress [34].

The pattern of the graph (see figure 2) suggests that the start of an action is largely determined by unconscious neural processes. However, the sudden rise in conscious intention indicates that awareness can still modulate or even veto the action before it occurs. Overall, the graph demonstrates that voluntary action results from an interplay between deterministic neural preparation and conscious control, supporting the notion of partial or constrained free will rather than complete autonomous control.

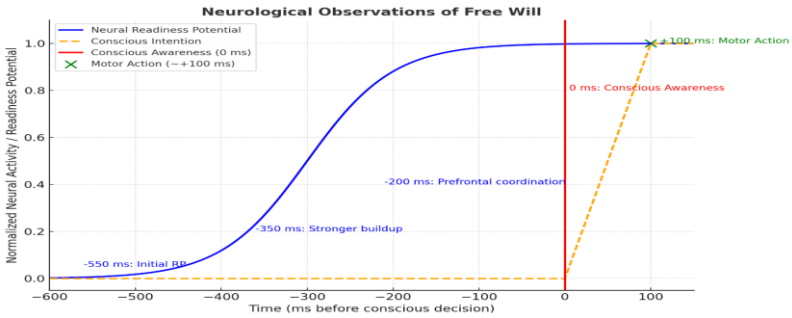



**Figure 2. Graph Representing Neurological Observations of Free Will.**

**Figure 2:** This graph illustrates the timing of neural and conscious processes during voluntary action. The blue line shows the neural readiness potential (RP), which begins rising around –550 ms, indicating that the motor cortex (MC) is preparing the movement unconsciously well before conscious awareness. The signal gradually strengthens through –350 ms and –200 ms, reflecting coordinated activity across prefrontal areas (PFA) and deterministic preparation for action. The orange line represents conscious intention (CI), which stays flat until 0 ms and then rises sharply, marking the moment the participant becomes aware of the decision. The red vertical line at 0 ms denotes conscious awareness, while the green marker at +100 ms shows the actual motor action (MA). The temporal gap between the rising neural activity and conscious intention highlights that unconscious brain processes precede awareness by several hundred milliseconds.

**Abbreviations**: RP – Readiness Potential, MC – Motor Cortex, PFA – Prefrontal Areas, CI – Conscious Intention, MA – Motor Action, ms – milliseconds

## 7. Case History: Neurological, Metabolic, and Genetic Influences

### 7.1 Evaluation of Patient Profiles and Findings

**Case 1** (42-year-old male): This patient illustrates how neurological injury (traumatic brain injury, TBI) and metabolic disorder (type 2 diabetes) together can reduce impulse control and impair rational decision-making. Although he is aware of the consequences of his actions, he struggles to act accordingly, reflecting weakened executive function rather than a complete loss of free will.

**Case 2** (28-year-old female): Despite a strong genetic predisposition to neuropsychiatric conditions, she maintains resilience and agency. This demonstrates that genetic risk does not equate to determinism, highlighting the moderating role of environment and personal coping strategies.

### 7.2 Neurological Findings

**Case 1:** Reduced prefrontal cortex (PFC) activity and atypical EEG readiness potentials indicate diminished capacity for self-regulation and conscious modulation of actions [35]. **Case 2:** COMT polymorphisms affect dopamine metabolism, influencing reward sensitivity and decision-making [38]. This shows that inherited neural predispositions shape, but do not fully determine, the capacity for free will. **Insight:** Neurological integrity is central to voluntary action, but impairments differ between acquired injuries and genetic risk factors.

### 7.3 Metabolic and Biochemical Findings

**Case 1:** Poor glucose regulation (HbA1c > 8.5%) compromises dopaminergic pathways, reducing motivation and impulse control [37].

**Case 2:** No metabolic deficits, though her dopaminergic signaling is indirectly shaped by genetic polymorphisms. **Insight:** Metabolic function acts as a physiological amplifier of neural activity. Dysregulation can further limit the capacity for autonomous action.

### 7.4 Cultural and Environmental Context

**Case 1:** Raised in a collectivist environment emphasizing family responsibility, which influenced his choices despite biological constraints [39].

**Case 2:** Cultural resilience and supportive social factors buffered against genetic vulnerabilities, enhancing her agency [39]. **Insight:** Cultural and environmental contexts shape how free will is expressed and can moderate biological limitations.

### 7.5 Evaluation and Integration

Free will appears to function along a continuum, influenced by neurological integrity, metabolic regulation, genetic predispositions, and cultural context. Case 1 illustrates how biological impairments can restrict autonomy, whereas Case 2 demonstrates resilience despite genetic risk. Overall, free will can be seen as **constrained autonomy**, which may be supported or enhanced through medical, psychological, and cultural interventions.

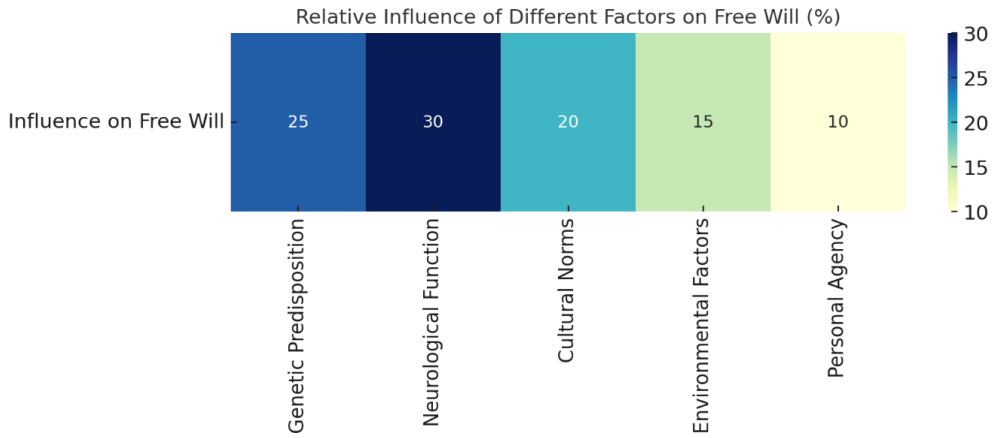



**Figure 3: The heatmap illustrates free will as a multidimensional construct influenced by interacting factors. Neurological function (30%) is the largest contributor, highlighting the importance of prefrontal cortex activity and readiness potentials in guiding decisions [35]. Genetic predispositions (25%) affect impulse control through dopaminergic and serotonin pathways [38]. Cultural norms (20%) shape how autonomy is expressed across societies [39], while environmental factors (15%), such as stress and socioeconomic conditions, influence behavior. Personal agency (10%) represents the conscious ability to reflect, override impulses, and act in accordance with one's values.**

## CONCLUSION

Whether free will truly exists in the human mind cannot be answered with absolute certainty. However, evidence from philosophy, neuroscience, psychology, and cultural studies suggests that autonomy is both real and constrained. Philosophical debates highlight the tension between determinism and libertarianism, while compatibilism offers a pragmatic middle ground. Neuroscientific research, including Libet's experiments, shows that neural readiness potentials arise hundreds of milliseconds before conscious awareness, indicating that unconscious processes initiate actions, yet conscious intention can still modulate or veto behavior. Case histories demonstrate that neurological impairments, such as reduced prefrontal cortex function, and metabolic dysfunctions, like insulin resistance affecting dopaminergic signaling, can limit decision-making autonomy, highlighting the biological foundations of free will. Genetics and cultural upbringing further shape how individuals perceive and exercise choice, revealing that free will is partly inherited and partly influenced by social context. The heatmap analysis confirms that free will is multidimensional: neurological function (30%) and genetic predisposition (25%) exert the strongest influence, followed by cultural norms (20%), environmental factors (15%), and personal agency (10%).

In sum, free will may not exist as an absolute metaphysical entity, but it remains functionally meaningful—a constrained yet essential capacity shaped by brain processes, genetics, culture, and conscious self-reflection.

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