



NEUROSCIENCE

why we have free will

Neurons fire in your head before you become aware that you have made a decision. But this discovery does not mean you are a “biochemical puppet”

By Eddy Nahmias

One night last fall I lay awake wondering how I should begin this essay. I imagined a variety of ways I could write the first sentence and the next and the one after that. Then I thought about how I could tie those sentences to the following paragraph and the rest of the article. The pros and cons of each of those options circled back and forth in my head, keeping me from drifting off to sleep. As this was happening, neurons were buzzing away in my brain. Indeed, that neural activity explains *why* I imagined these options, and it explains why I am writing these very words. It also explains why I have free will.

Increasingly, neuroscientists, psychologists and pundits say that I am wrong. Invoking a number of widely cited neuroscientific studies, they claim that unconscious processes drove me to select the words I ultimately wrote. Their arguments suggest our conscious deliberation and decisions happen only after neural gears below the level of our conscious awareness have already determined what we will choose. And they conclude that because “our brains make us do it”—choosing for us one option over another—free will is nothing more than an illusion.



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The experiments most often cited to show that our brains take charge behind the scenes were carried out by the late Benjamin Libet in the 1980s at the University of California, San Francisco. There he instructed study participants outfitted with electrodes on their heads to flick their wrists whenever they felt like it. The electrodes detected fluctuations in electrical activity called readiness potentials that occurred about half a second before people made the flicking motion. But participants became aware of their intentions to move only about a quarter of a second before the movement, leading to the conclusion that their brains had decided before they became aware of what had happened. In essence, unconscious brain processes were in the driver's seat.

More recent studies using functional MRI have suggested the unconscious roots of our decisions begin even earlier. In research published in 2013, neuroscientist John-Dylan Haynes of the Bernstein Center for Computational Neuroscience Berlin and his colleagues had volunteers decide whether to add or subtract two numbers while in the fMRI scanner. They found patterns of neural activity that were predictive of whether subjects would choose to add or subtract that occurred four seconds before those subjects were aware of making the choice—a rather long lag time.

Indeed, both these studies—and others like them—have led to sweeping pronouncements that free will is dead. “Our decisions are predetermined unconsciously a long time before our consciousness kicks in,” Haynes commented to *New Scientist*, while adding that “it seems that the brain is making the decision before the person.” Others share his opinion. Evolutionary biologist Jerry Coyne has written: “So it is with all of our ... choices: not one of them results from a free and conscious decision on our part. There is no freedom of choice, no free will.” Neuroscientist Sam Harris has concluded from these findings that we are “biochemical puppets”: “If we were to detect [people’s] conscious choices on a brain scanner seconds before they were aware of them ... this would directly challenge their status as conscious agents in control of their inner lives.”

But does the research really show that all our conscious deliberation and planning is just a by-product of unconscious brain activity, having no effect on what we do later on? No, not at all. For many reasons, others, such as philosopher Alfred R. Mele of Florida State University, and I argue that people who insist free will is a mirage are misguided.

NOT SO FAST

I CALL THOSE who contend that science shows that free will is an illusion “willusionists.” There are many reasons to be wary of the willusionists’ arguments. First, neuroscience currently lacks the technical sophistication to determine whether neural activity underlying our imagining and evaluating of future options has any impact on which option we then carry out minutes, hours or days

later. Instead the research discussed by willusionists fails to clearly define the border between conscious and unconscious actions.

Consider the Libet experiment. It began with study participants preparing consciously to make a series of repetitive and unplanned actions. When the experiment began, they flexed their wrists when a desire arose spontaneously. The neural activity involved in the conscious planning presumably influenced the later unconscious initiation of movements, revealing an interaction between conscious and unconscious brain activity.

Similarly, the Haynes study, in which people randomly picked whether to add or subtract over the course of many trials, fails to provide convincing evidence against free will. Early brain activity that occurred four seconds before participants were aware of making a choice may be an indication of unconscious biases toward one choice or the other.

But this early brain activity predicted a choice with an accuracy only 10 percent better than could be forecast with a coin flip. Brain activity cannot, in general, *settle* our choices four seconds before we act, because we can react to changes in our situation in less time than that. If we could not, we would all have died in car crashes by now! Unconscious neural activity, however, can prepare us to take an action by cuing us to consciously monitor our actions to let us adjust our behavior as it occurs.

Willusionists also point to psychological research showing that we have less conscious control over our actions than we think. It is true that we are often influenced unknowingly by subtle features of our environment and by emotional or cognitive biases. Until we understand them, we are not free to try to counteract them. This is one reason I think we have less free will than many people tend to believe. But there is a big difference between having less and none at all.

The Libet and Haynes research deals with choices that people make without conscious deliberation at the time of action. Everyone performs repetitive or habitual behaviors, sometimes quite sophisticated ones that do not require much thought because the behaviors have been learned. You put your key in the lock. A shortstop dives for a ground ball. A pianist becomes immersed in playing Beethoven’s *Moonlight Sonata*.

The reflexive turning of the key, the lunging for the ball, or the depressing of the white and black keys requires a particular type

IN BRIEF

A major question in neuroscience, in philosophy and in broader public debate is whether the assumption that we have free will is fundamentally misconstrued. If it is, many legal and moral precepts that are the basis for our social institutions are subject to challenge.

Doubts exist because of sophisticated experiments in recent decades that have shown that the brain initiates at least some actions before we become consciously aware that a decision has been made. If this is so, what role, if any, does free will play?

People may have less free will than they think, but that does not mean they have none at all. A number of recent experiments by social psychologists have shown that conscious reasoning and intentions have a significant impact on our actions.

of mental processing. What I was doing on that sleepless night—conscious consideration of alternative options—is a wholly different activity from engaging in practiced routines. A body of psychological research shows that conscious, purposeful processing of our thoughts really does make a difference to what we do.

This work indicates that intentions we formulate to carry out specific tasks in particular circumstances—what psychologists call “implementation intentions”—increase the likelihood that we will complete the planned behavior. A study performed by psychologist Peter Gollwitzer of New York University and his colleagues revealed that dieters who consciously formed an intention to ignore thoughts about tempting foods whenever they came to mind then ate less of those foods than those dieters who simply set the goal to lose weight.

Psychologist Roy F. Baumeister of Florida State University and his colleagues have demonstrated that conscious reasoning improves performance on logical and linguistic tasks and that it helps in learning from past mistakes and overriding impulsive behaviors. In addition, psychologist Walter Mischel of Columbia University has found that our ability to willfully distract ourselves from a temptation is crucial for self-control.

Every one of us takes actions every day that we have consciously planned for ourselves. It is possible that the neural activity that carries out this planning has no effect on what we do or that it just concocts stories after the fact to explain to ourselves and others what we did. But that would make little evolutionary sense. The brain makes up only 2 percent of the human body’s weight but consumes 20 percent of its energy. There would be strong evolutionary pressure against neural processes that enable intricate conscious thought yet are irrelevant to our behavior. The brain circuits responsible for my imagining that this is the best way to write this essay are likely causing it to turn out this way.

FREE WILL IN THE BRAIN?

WILLUSIONISTS, however, suggest this internalized brain processing simply cannot count as free will. They often say that people who believe in free will must be “dualists” who are convinced that the mind somehow exists as a nonphysical entity, separate from the brain. “Free will is the idea that we make choices and have thoughts independent of anything remotely resembling a physical process,” wrote neuroscientist Read Montague in 2008. And Coyne has claimed that “true ‘free will’ ... would require us to step outside of our brain’s structure and modify how it works.”

It is true that some people think of free will in this way. But there is no good reason to do so. Most philosophical theories develop a view of free will that is consistent with a scientific understanding of human nature. And despite willusionists’ claims, studies suggest that most people accept that we can have free will even if our mental activity is carried out entirely by brain activity. If most people are not dualists about free will, then it is a mistake to tell them that free will is an illusion based on the scientific view that dualism is false.

One way to test people’s assumptions about free will is to describe the possibility of brain-imaging technology that would allow perfect prediction of actions based on information about prior brain activity. In fact, Harris has suggested this scenario “would expose this feeling [of free will] for what it is: an *illusion*.”

To see whether people’s belief in free will would be challenged by the knowledge that the brain is engaged in unconscious infor-

mation processing that predicts behavior, Jason Shepard of Emory University, Shane Reuter of Washington University in St. Louis and I recently performed a series of experiments in which we presented people with detailed scenarios describing futuristic brain-imaging technology, as posited by Harris.

Hundreds of students at Georgia State University participated in the studies. They read about a woman named Jill who, in the distant future, wore a brain-imaging cap for a month. Using information from the brain scanner, neuroscientists predicted everything she thought and did, even when she tried to fool the system. The scenario concluded that “these experiments confirm that all human mental activity just *is* brain activity such that everything that any human thinks or does could be predicted ahead of time based on their earlier brain activity.”

More than 80 percent of the participants reported that they believed that such future technology was possible, yet 87 percent of them responded that Jill still had free will. They were also asked whether the existence of such technology would indicate that individuals lack free will. Roughly 75 percent disagreed. Further results showed that a significant majority felt that as long as the technology did not allow people’s brains to be manipulated and controlled by others, they would have free will and be morally responsible for their behavior.

Most participants in the experiments seem to think that the hypothetical brain scanner is just recording the brain activity that is Jill’s conscious reasoning and consideration about what to decide. Rather than taking this to mean that Jill’s brain is making her do something—and that she has no free will—they may just be thinking that the brain scanner is simply detecting how free will works in the brain.

Why, then, do willusionists believe the opposite? It may have to do with the current state of knowledge. Until neuroscience is able to explain consciousness—which will require a theory to explain how our minds are neither reducible to, nor distinct from, the workings of our brain—it is tempting to think, as the willusionists seem to, that if the brain does it all, there is nothing left for the conscious mind to do.

As neuroscience advances and imaging technology improves, these developments should help reveal more precisely how much conscious control we have and to what extent our actions are governed by processes beyond our control. Finding resolutions for these questions about free will is important. Our legal system—and the moral basis for many of our society’s institutions—requires a better understanding of when people are—and are not—responsible for what they do. ■

MORE TO EXPLORE

Do Conscious Thoughts Cause Behavior? Roy F. Baumeister, E. J. Masciaro and Kathleen D. Vohs in *Annual Review of Psychology*, Vol. 62, pages 331–361; January 2011.

Predicting Free Choices for Abstract Intentions. Chun Siong Soon et al. in *Proceedings of the National Academy of Sciences USA*, Vol. 110, No. 15, pages 6217–6222; April 9, 2013.

It’s OK If “My Brain Made Me Do It”: People’s Intuitions about Free Will and Neuroscientific Prediction. Eddy Nahmias, Jason Shepard and Shane Reuter in *Cognition*, Vol. 133, No. 2, pages 502–516; November 2014.

FROM OUR ARCHIVES

Thought Experiments. Joshua Knobe; November 2011.

scientificamerican.com/magazine/sa