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Neuroscientific challenges to free will and responsibility

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Recent developments in neuroscience raise the worry that understanding how brains cause behavior will undermine our views about free will and, consequently, about moral responsibility. The potential ethical consequences of such a result are sweeping. I provide three reasons to think that these worries seemingly inspired by neuroscience are misplaced. First, problems for common-sense notions of freedom exist independently of neuroscientific advances. Second, neuroscience is not in a position to undermine our intuitive notions. Third, recent empirical studies suggest that even if people do misconstrue neuroscientific results as relevant to our notion of freedom, our judgments of moral responsibility will remain largely unaffected. These considerations suggest that neuroethical concerns about challenges to our conception of freedom are misguided.

Introduction

Advances in neuroscience provide us with an increasingly mechanistic view of how the brain generates complex thought and behavior. This trend has led some to worry that future advances will lead people to abandon their belief that we are free agents and, consequently, that our views of moral responsibility will be undermined [1–4].

I suggest that these worries are misplaced. First, problems for our intuitive notions of freedom exist prior to and independently of neuroscientific knowledge and advances. Second, analysis of the problem of freedom suggests that neuroscience is not in a position to undermine our intuitive notions; rather, challenges to our conception of freedom come primarily from other considerations. Finally, recent empirical studies suggest that even if people misconstrue neuroscientific results as relevant to the viability of our notion of freedom, our judgments of moral responsibility will be largely unaffected. So although we are faced with many pressing neuroethical questions [5–11], the status of free will is not among them.

Other challenges to free will

The challenge from above

The intuitive notion of freedom is that we are in some sense in charge of our own actions. Doubts as to whether human beings have free will have traditionally been inspired by both theological doctrine and physical theory. Reconciling an omniscient and omnipotent God with human freedom has exercised thinkers for two millennia. If God is omnipotent and controls our actions, then we could not have acted other than we did. Theologians have often responded to this by allowing that God's omnipotence means that he could control our actions if he so wished, but that human freedom is preserved because he refrains from controlling us. However, God's omniscience presents a further problem for human freedom, for even if God does not control our actions, if he knows now how we will act before we act, then we are not free to do otherwise – foreknowledge seems to foreclose the possibility of freedom of the will, for our actions are predetermined [12].

The challenge from below

Naturalistic worldviews also pose a dilemma for the defender of freedom. The physicalist who denies that there are supernatural forces in the universe, and believes instead that the evolution of the universe is entirely determined by its prior state and the operation of natural laws is faced with a challenge to freedom similar to that of divine predetermination. For if the universe is deterministic (see Glossary), then everything, including our actions and the brain activity that causes them, is as it is only because of the initial state of the universe and natural laws. If this is the case, then we cannot do other than we do, and so are not free [13–16]. As the problem with this view seems to stem from the assumption of determinism, many people intuitively believe that the naturalistic approach can be congenial to freedom only if determinism is false [17,18]. Thus, the idea is that in a physicalistic and non-deterministic universe, both a scientific worldview and freedom can be salvaged. The favored interpretations of quantum mechanics, for example, hold that the collapse of the wave-function is indeterministic. Perhaps unsurprisingly, most people think that the universe is not deterministic and that we have free will [19–21].

However, salvaging freedom is not as easy as it might seem. For if the universe is not deterministic, then the other clear scientific alternative is that undetermined events are random [16]. If our actions are not determined, but instead due to these chance events, then it is chance, and not our will, that leads us to act as we do. Randomness as the cause of action is as difficult to reconcile with a notion of freedom of the will, and its attendant implication of moral responsibility, as is determinism.

Thus, problems for freedom of the will arise whether one believes that the universe is governed by an omniscient, omnipotent God, or just by natural forces. These challenges exist independently of the progress of neuroscience.

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Glossary of philosophical positions relating to the free-will debate

Agent causation: a type of causation due to agent choice, not itself caused by physical events.
Compatibilism: freedom is compatible with determinism. When coupled with a commitment to determinism, it is called soft determinism (See also Figure I.).
Determinism: the state of the universe is entirely a function of physical law and the initial conditions of the universe.
Eliminativism: science will show our folk psychological concepts, such as belief, desire and so on, to be scientifically untenable, and that they should therefore be jettisoned.
Epiphenomenalism: mental states are physically caused but have no physical effects.
Hard determinism: the universe is deterministic and we are not free; freedom is just an illusion.
Incompatibilism: claims that freedom is incompatible with determinism. Incompatibilists who believe determinism is true are called hard determinists. Incompatibilists that believe that determinism is false are called libertarians.
Libertarianism: The universe is indeterministic, but we are nonetheless free. There are different types of indeterministic events: chance events and choice events. Human choice is not subject to physical law, but nonetheless stem from the operation of the will and is causally efficacious. This view does not seem to cohere with any scientific picture that we know.
Reductionism: High-level concepts can be fully accounted for in terms of lower-level concepts. In the context of the free-will debate, the claim is that mentalistic terms such as choice will be shown to be fully explicable in terms of brute mechanism.

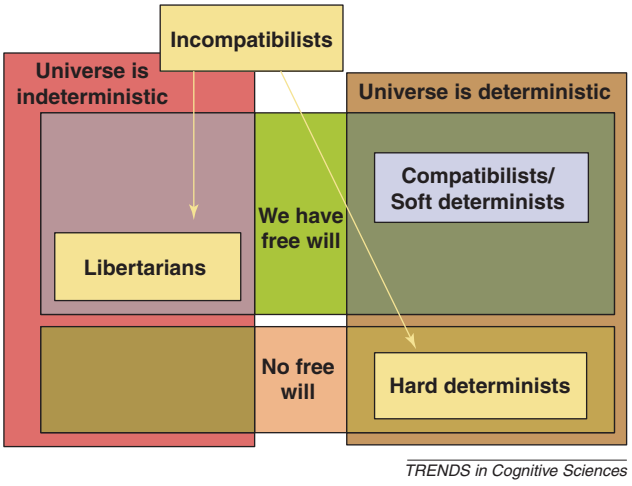

Figure I. A schematic mapping of the main philosophical positions on freedom of the will (see text for details).

Will neuroscience undermine free will?

Why is neuroscience perceived to be a threat?

Given that the philosophical territory is well-explored and has been so for centuries [16], why is there a resurgence of concern over the status of free will [22–25]?

I believe the current hand-wringing about freedom and moral responsibility stems largely from the fact that only recently has it become feasible to investigate cognitive phenomena that are hallmarks of what it is to be human [1,2,4,26]. There is now a widespread and industrious scientific community, whose aim is to understand the mechanisms underlying these phenomena [7,9,10, 27–32]. The underlying worry is that those things that once seemed to be forever beyond the reach of science might soon succumb to it: neuroscience will lead us to see the 'universe within' as just part and parcel of the law-bound machine that is the universe without. The decisions, choices and actions we take are generally thought to be freely willed. But science reveals them, or threatens to reveal them, to be mechanistically or physically intelligible, and some have argued that our intuitive notions of freedom are thereby mistaken [14,33,34]. If God's foreknowledge posed a problem for freedom of the will, how much more destructive to our intuitions would it be if we as humans knew enough to foresee how our brains would respond to various situations or choices? If our choices and our actions are revealed to be the result of neural mechanisms, how can we preserve our intuitions about freedom and its conceptual partner, moral responsibility?

However, although this reasoning and the fears it engenders might seem on the face of it to be sound, they are not. As discussed above, significant challenges to freedom and moral responsibility exist independently of neuroscientific advances. Understanding the brain mechanisms underlying choice and action merely increases awareness of antecedently existing problems.

Although philosophical analysis reveals problems for free will whether or not the universe is deterministic, many people think that freedom can yet be salvaged if the universe is indeterministic, for they favor a Libertarian account which posits an agent as an uncaused cause [17,18]. In that case, trouble arises if the universe is deterministic.

Neuroscience can suggest mechanism, but not determinism

Can neuroscience indicate that we live in a deterministic universe? No: neuroscience will remain silent on this matter. The picture that neuroscience has yielded so far is one of mechanisms infused with indeterministic or stochastic (random or probabilistic) processes. Whether or not a neuron will fire, what pattern of action potentials it generates, or how many synaptic vesicles are released have all been characterized as stochastic phenomena in our current best models. However, whether the unpredictability we perceive is really due to fundamentally indeterministic processes, or to complex deterministic ones beyond our present understanding is something neuroscience cannot tell us. Apparent indeterminism at one level of

description is entirely compatible with determinism at the fundamental physical level. Because a deterministic system can radically diverge in its behavior depending on infinitesimal changes in initial conditions, no evidence for indeterminism at the level of neurons or regions of activation will have any bearing on the fundamental question of whether or not the universe is deterministic [16,26]. That is ultimately a question for physical theory, and will be answered by our best theory of the fundamental nature of physics, not at the level of brain science. In any case, none of the techniques that has actually contributed to the growing existential angst about freedom provides reliable information about low-level neural phenomena.

What neuroscience can indicate is that, regardless of whether or not the universe is deterministic, the brain effectively is [16]. That is, at some higher level than the motions and interactions of atoms and molecules, low-level indeterminacies wash out and the high-level operation of the system can be characterized by laws, so that its future activity can be reliably predicted on the basis of its past activity. Determinism is an assumption that many scientists adhere to, but it is likely always to remain an assumption. It is difficult to conceive of what additional evidence could compel us to take this assumption as fact. Moreover, although scientific successes are evidence that behavior is driven by biological mechanism rather than 'the soul', neuroscientific results cannot prove that we are nothing more than mechanism. An understanding of the potential yields of neuroscientific techniques reveals them to be rather impotent for exacerbating the status of the free will problem.

Will neuroscience change our views about moral responsibility?

A problem of perception

The above discussion really only concerns the objective question of whether we have free will. That question can be raised regardless of what we know about the brain. A view of ourselves as biological mechanisms should not undermine our notion of ourselves as free and responsible agents. After all, some causal notion is needed for attributions of moral responsibility to make sense. The predictive power of our high-level psychological generalizations grounds our views of agency, so further evidence that we behave in a law-like fashion should not undermine our notions of freedom.

But perhaps it is the *perception* of the existence of a problem that is itself the problem. We care about free will primarily because we care about what comes along with it – moral responsibility. So maybe the deep worry is that the fabric of society will dissolve if people come to believe that we are not free and thus not morally responsible [3,23,35,36]. The issue is then not whether or not neuroscience actually challenges human freedom, but whether or not we think it does. New data provide further reason for sanguinity even in the face of this *prima facie* real threat.

The threat to intuitive notions of freedom

Let us revisit the nature of the perceived threat. Most people are not compatibilists: they deny that we can be both free and determined. So, the argument goes, if people are intuitive incompatibilists (as some philosophers surmise [19,37]), and if we come to believe that decisions and actions are not freely chosen but rather necessitated by the fact that our brains are 'merely' physical systems subject to natural laws, then we will abandon our belief that we are in control of our actions and thus responsible for them. If moral responsibility is found to be incoherent, then our social, moral and legal systems will be eviscerated and the result will be chaos [3,35].

Are people really intuitive incompatibilists?

Experimental evidence backs the claim that people have Libertarian intuitions. Nichols [19] argues that from a young age children believe in something like agent-causation: they believe that people are able to cause their own actions and that, for a given action, they could have done otherwise. Experiments with college students likewise suggest that people's theoretical intuitions about free will are Libertarian [21]. Asked to judge whether our world is more similar to a deterministic or indeterministic world, 90–95% of people judge that our own universe is indeterministic; they also judge that people generally have free will, and that they are morally responsible for their actions [21]. If folk are natural incompatibilists, and if neuroscientific work causes them to believe instead that we are mechanistic systems in a deterministic universe, then belief in moral responsibility could potentially be jeopardized, vindicating the above worries about the effects of neuroscience on our notions of freedom and responsibility. Interestingly, however, other experimental evidence points in the opposite direction. People's judgments of freedom and responsibility appear to be compatibilist when given concrete scenarios of a person's wrongful actions in an explicitly deterministic world. In such cases,

Box 1. The effects of emotion on people's intuitions about responsibility

In Nichols and Knobe's experiment [21], subjects were given initial descriptions of two universes, deterministic and indeterministic, and asked which was more like our own. The vast majority of subjects indicated they thought that ours was an indeterministic universe. Subjects were then given a scenario depicting either a *high-affect* or *low-affect* scenario, set in either the deterministic or the indeterministic universe. In the high-affect condition, subjects were asked the following:

'As he has done many times in the past, Bill stalks and rapes a stranger. Is it possible that Bill is fully morally responsible for raping the stranger?'

In the low-affect condition, subjects were asked:

'As he has done many times in the past, Mark arranges to cheat on his taxes. Is it possible that Mark is fully morally responsible for cheating on his taxes?'

In the determinist scenario, approximately twice the percentage of subjects gave an incompatibilist answer in the high-affect case than the low-affect case. That is, most people said that it is *not* possible in a determinist universe that the tax cheat is fully morally responsible, but a clear majority said that it *is* possible that the rapist is fully morally responsible. By contrast, for subjects who were asked about an agent in an indeterminist universe, most people said that it is possible for the agent to be fully morally responsible, regardless of whether he was a tax cheat or a rapist [21].

60–85% of people say that an agent is morally responsible for his actions even under the assumption that determinism is true [38,39]. Two conflicting interpretations of this surprising dissociation have been suggested.

Judgments of responsibility are driven by emotion

Nichols and Knobe [21] hypothesize that emotion has a crucial role in modulating our judgments of freedom and responsibility: neutral questions are evaluated coolly and analytically, but some judgments are modulated by emotional arousal. Their work suggests that abstract questions about responsibility are relatively emotionally neutral, but concrete cases vary in the extent to which they elicit affective responses. Nichols and Knobe [21] demonstrated that the percentage of people making incompatibilist judgments varied inversely with the level of affect elicited by the case descriptions (Box 1). These results are consistent with studies showing that brain areas known to subserve emotion are active during some types of moral reasoning, and that these areas are activated more during reasoning about more arousing scenarios [21,30]. Nichols and Knobe postulate that people's conflicting intuitions in different moral scenarios are attributable to the operation of two different subsystems that govern reasoning about moral responsibility. One is harnessed in emotionally neutral cases such as the evaluation of abstract questions, which tends to produce judgments consistent with incompatibilist intuitions, and the other is triggered by emotional responses and leads to judgments in line with compatibilist intuitions.

If this view is correct, it indicates that the actual psychological processes involved in everyday moral judgments of responsibility are likely to operate largely independently of theoretical views about determinism and mechanism. Such a view is not new. P.F. Strawson [40] argued as much when he wrote: 'A sustained objectivity of inter-personal attitude, and the human isolation which that would entail, does not seem to be something of which human beings would be capable, even if some general truth were a theoretical ground for it'. Because in ordinary life our judgments about responsibility are almost always of highly contextualized, emotionally-charged, concrete scenarios, people's worries about the effect a mechanistic view of the brain might have on belief in moral responsibility might well be misplaced (Box 2).

Perhaps the problem isn't determinism

However, Nahmias [41] suggests an alternative interpretation of the implications of Nichols and Knobe's results. He argues that these experiments indicate that our beliefs about determinism are irrelevant to judgments about freedom and responsibility, and suggests instead that neuroscience might undermine our notions of freedom not by showing the brain to operate deterministically, but by altering our understanding of the way in which our decisions and choices come about. He postulates that what induces people to deny moral responsibility is the impression that the causes of behavior bypass or themselves control our conscious mental life [41]. Thus, according to Nahmias, it is not determinism but reductionism and its consequences that threaten the notions of free will and responsibility: ' ... a principal psychological mechanism that drives incompatibilist intuitions involves people's fear of reductionistic descriptions of deliberation and decision-making'. Similar points have been made by others [33,42,43]. Nahmias' suggestion is that people take neuroscientific evidence to support a reductionist view of human agency, one that allows no causal role for mental states. Consequently, neuroscience is apt to threaten notions of freedom and responsibility. This view is borne out by another series of experimental results, which point to the conclusion that determinism is a threat to moral responsibility when the causes of behavior are perceived to bypass mental states [41]. If so, perhaps the Nichols and Knobe experiments do not address the essential question, and it is reductionism and its attendant consequences, epiphenomenalism or eliminativism, that are most to be feared as a threat to freedom.

How does this bear upon our question? If Nahmias is correct, then neuroscience will substantially change our views about moral agency only if it is seen to preclude causal mentalistic descriptions of mechanistic states. Whether this is a salient possibility depends upon how neuroscientific views of behavior mesh with folk psychology, upon how such results are presented to the public, and upon whether our judgments in the face of reductionism are insulated from modulation by affect. Despite some philosophical predictions on the first point [42,44,45], the verdict on all these issues is very much still out. However, although it is conceivable that a conception of mechanism inconsistent with views of agency could potentially undermine our views of moral responsibility, I believe it is more likely that views of agency will evolve to mesh with scientific understanding, and, as experiments suggest, that our views about personal moral responsibility are robust.

More work needs to be done in understanding the relation of people's theoretical outlook to their judgments in actual cases, but preliminary results suggest that even if neuroscientific advances were to affect our theoretical views about human freedom, they are not likely to affect practical judgments of moral responsibility.

Box 2. Legal ramifications

There is mounting interest in the implications of neuroscience for the law [25,32,36,46,48–50]. Despite indications that people's judgments about blame and responsibility are largely independent of their metaphysical views, one area that might see a considerable change as a result of widespread acknowledgement of the mind as mechanistic is our judicial system. When asked to judge whether a person is blameless in concrete moral scenarios, ~15% more people judged a person to be blameless in a deterministic universe than in an indeterministic universe [21].This suggests that a proportion of people, albeit a small one, actually do change their minds about moral culpability when they conceive of the world as deterministic rather than indeterministic. Although this percentage might be too small to threaten the moral fabric of society, it is enough to alter the outcome of a jury's decision in a criminal case where decisions have to be unanimous. It does seem to be a real possibility, then, that the number of convictions in criminal cases could be affected if there is widespread change in people's conception of the mind as part of the mechanistic fabric of the universe. However, as some have suggested [25], this might warrant a concomitant rethinking of the purpose of criminal prosecution: framing criminal proceedings in terms of deterrent value rather than in terms of retributivist justice could lead to an overall improvement of the criminal justice system.

Concluding remarks

Recent neuroscientific research has galvanized public interest in ethical issues, including whether we are free and responsible. I have argued that advances in cognitive neuroscience have little or no bearing on the question of whether we have free will, and that even if they do affect the public's apprehension of the problem, they predict little effect on actual judgments of moral responsibility. Thus, in this particular domain, I do not believe that neuroscience will significantly impact our ethical outlook. Does this also mean that neuroscience has nothing to contribute to the free will debate? Here the answer is less clear. I believe that the traditional debate is somewhat ill-conceived, and that a neurally informed reconceptualization of ethical concepts such as choice, agency and control could provide us a way out of the conundrum that is the problem of the will [46]. For example, perhaps *control,* not freedom*,* is the appropriate notion to act as intermediary between decision and action on the one hand, and moral responsibility on the other. Rather than understanding control as 'ability to do otherwise' [12,16], we should view it in the context of the proper functioning of a system, and something that must be elucidated for each particular type of system [4,26]. As neuroscience and psychology provide us with more insight into the processes involved in decision-making and regulation of behavior in humans, it might be possible to frame a new theory that takes into account what is known about moral cognition, self-representation and self-regulation, in formulating a conception of what brain regions and processes are essential for our responsible functioning in society [47]. Thus, neuroscience might enable us to develop a more sophisticated view of responsibility that takes into account both the cognitive demands and the control demands made by intuitive and legal notions of responsibility, and reconciles them with a scientifically informed view of the brain as a physical system that governs our actions. This could result in a compatibilist theory of moral responsibility that is not predicated on paradoxical views of absence of causation or freedom from causal laws.

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