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Could Raatikainen have written otherwise?

Valtteri Arstila

I had the privilege of having Panu as the external examiner of my licentiate thesis in 2002. The following year, we met occasionally while both abroad, and it was during this time that I became more closely acquainted with his research. As anyone who knows him will attest, Panu's intellectual interests are both wide-ranging and deeply considered. One of the themes I have especially enjoyed reading about in his work concerns the notion of free will. With a short commentary on his work on this topic, I would like to extend my warm congratulations to Panu on the occasion of his 60th birthday.

Introduction

The question of free will is one of the most classic and debated topics in philosophy, and the related problem of mental causation has played a central role in the philosophy of mind since Descartes' interactionism (Raatikainen 2018). This question can be summarized as follows: can we act freely—that is, do we genuinely possess free will—or are our actions ultimately determined by natural laws or other deterministic factors?

The question sets free will against determinism. According to the former, we can genuinely choose between different courses of action, and our actions are truly our own. Hence, it is, for example, reasonable to assume that at least some of Panu Raatikainen's claims in his extensive writings on the subject (2007; 2010; 2013; 2015; 2017; 2018) were made due to his own choices. Given that the capacity for free will

Arstila, V. (2025). Could Raatikainen have written otherwise? In A. Laitinen, M. Keinänen, J. Reinikainen & A. Honkasalo (eds.). *Language, Truth, and Reality*. Tampere University Press. (pp. 280–295). https://doi.org/10.61201/h5fbdk64

is often tied to moral responsibility for decisions and actions, Raatikainen would deserve praise (or blame) for his writings.

Determinism, traditionally seen as challenging free will, claims that prior occurrences and deterministic natural laws determine all events. According to this view, given certain initial conditions, the universe can evolve in only one way under such natural laws. Consequently, all human actions would be predetermined, including Raatikainen's writing process and the texts he produced. Thus, he could not have written otherwise.

Several solutions have been proposed to the question of free will. Considering the robustness of our intuitions regarding free will, the most straightforward solution might be to reject determinism. Supporting this view, current quantum physics suggests that natural laws may be inherently probabilistic rather than strictly deterministic. If, for instance, some version of quantum consciousness theories proves correct, we might consciously make choices that are not predetermined. However, most consciousness researchers regard such views of consciousness with considerable skepticism.

Another solution is to reconcile free will and determinism, as compatibilists have attempted to do. This approach hinges on how free will is defined. The term is used differently in various discussions, and some definitions are compatible with determinism. Many contemporary compatibilists argue, for instance, that even if brain activity determines our decisions, our actions can be free in the sense that they arise from our desires and values, rather than from external coercion or chance. (Lavazza 2019; Raatikainen 2017.)

In recent decades, discussions concerning free will have revolved around two themes. The first pertains to the traditional argument against free will, namely the claim that all our decisions are causally determined and that this is incompatible with free will. A more recent development on this theme centers on the (causal) *exclusion argument*, introduced and developed by Jaegwon Kim (1998; 2005) in particular. This argument is directed against substance dualism and non-reductive physicalism. Consistent with Raatikainen's position and argumentation, I shall confine my discussion to the latter, which asserts that mental states supervene on physical states but are not identical with them. The exclusion argument holds that all physical events can be explained by physical processes. As a result, non-reductive physicalism leads to *epiphenomenalism*—the view that mental states and events are mere byproducts of physical processes without being causally efficacious within the physical domain. For example, neural activity in the brain might cause physical actions (such as extending a finger) and mental states (such as deciding to extend a finger), but the mental state would not affect the brain processes. In short, the causal efficacy of mental states in the physical domain is an illusion.

The second recent theme concerns *scientific epiphenomenalism*. Unlike metaphysical epiphenomenalism, this view is grounded in neuroscience findings rather than metaphysical principles. It is inspired by the experiments conducted by Benjamin Libet and colleagues since the late 1970s (e.g., Libet 1985; Libet et al. 1979;

1993). These experiments showed that brain activity related to actions occurs before subjects consciously report deciding to act (e.g., extend a finger). The results were interpreted as evidence that the brain initiates action preparation before conscious decision-making, suggesting that actions result from unconscious processes rather than conscious will. That is, the decision to extend a finger is not the cause of the finger's movement. Nonetheless, this causal inefficacy of our conscious decisions does not (necessarily) arise from determinism but from the observation that the brain "decides" before our conscious decision.

Both themes are featured in Raatikainen's extensive work on free will. He has focused mainly on analyzing the exclusion argument, critiquing it in light of various theories of causation, and arguing that the argument is ultimately unsuccessful. However, he has also criticized interpretations of Libet's experiments, which often underpin scientific epiphenomenalism. In this paper, I examine Raatikainen's critiques and offer critical observations regarding his arguments.

The causal exclusion argument

The argument against free will

The causal exclusion argument is one of the most central modern arguments challenging the causal efficacy of mental states. In recent decades, it has also been debated in connection with the problem of free will. The argument can be presented through four premises:

1. *Non-reductive physicalism*: Mental states (e.g., beliefs, desires, intentions) supervene on physical states but are not identical with physical states. Kim (1998; 2005) presented this argument against non-reductive physicalism (as well as dualism), which the critics of the exclusion argument typically support. According to this theory, mental states depend on brain activity and supervene on physical states, but they are not reducible to physical states. Hence, mental states are distinct from their physical bases. Non-reductive physicalism is often defended on the grounds of the multiple realizability of mental states (Putnam 1967), and Raatikainen (2010; 2013; 2015) is no exception.
2. *Causal closure of the physical*: Every physical event has a sufficient physical cause. This assumption asserts that all physical events have a sufficient physical cause. For example, the act of extending a finger is fully accounted for by neural impulses in the brain, without the need for anything else, such as a mental state, to account for the occurrence.
3. *Causal exclusion*: If a physical event has a sufficient physical cause, it does not have another distinct cause unless it is a case of overdetermination. The third premise holds that if a physical cause can account for a physical event, it cannot have another independent cause unless there is causal

overdetermination. Overdetermination means that the same event results simultaneously from two separate causes, for instance, mental and physical causes. However, the fourth assumption of the exclusion argument rules out this possibility.

4. *No systematic overdetermination*: The causes of physical events are not systematically and continuously overdetermined. The fourth premise denies the possibility that the causes of physical events are systematically overdetermined. Thus, causal overdetermination, if it occurs, would be a rare and exceptional phenomenon and cannot be applied to ordinary physical events.

From the last three premises, we can conclude the following: Since all events in the physical world have sufficient physical causes, and no other causes exist for them, mental states cannot be causes of physical events unless they are identical with physical states. However, the first premise, which concerns non-reductive physicalism, denies the identity of mental and physical states. This leads to the conclusion of the exclusion argument: mental states are epiphenomenal, meaning they have no causal role in the physical world.

Raatikainen's critique of the exclusion argument

Raatikainen adopts a critical stance toward the exclusion argument and aims to show that it does not force one to accept reductive physicalism or the epiphenomenality of mental states. His critique is grounded in a conceptual analysis of causation: he argues that the exclusion argument erroneously relies on a conception of causation that cannot be applied universally across all scientific disciplines and causal relationships. As a result, he maintains that the exclusion argument cannot establish that mental states are causally inefficacious.[1]

Raatikainen (2013; 2018) follows the distinction made by Ned Hall (2004; see also Lewis 1973) and divides theories of causation into two main categories: those based on *production* and those based on *dependence*. He argues Kim holds a contemporary version of a production-based view of causation, which emphasizes the role of physical processes that involve real connectedness in the relationship between cause and effect. Raatikainen refers to this theory as the "causation-as-transmission view" because it is grounded in the idea that a causal relationship is based on the transfer of energy or some other physical magnitude (e.g., charge or momentum) from cause to effect.

The causation-as-transmission view in the context of the exclusion argument is problematic in two ways, however (Raatikainen 2013; 2018). First, he notes that the production-based theory of causation is not viable in the special sciences (such as biology, psychology, or history), where causal relationships do not rely on energy

[1] Raatikainen's critique parallels similar criticisms put forward independently by other scholars around the same time (e.g., List and Menzies 2009; Menzies and List 2010; Sober et al. 2007; Woodward 2008). In this festschrift contribution, I will focus solely on his views and arguments.

transfer or other physical processes. In these sciences, causation is grounded in complex dependency relations among the variables and phenomena under investigation. This observation suggests that the causation-as-transmission view is, at most, suited to fundamental physics. Indeed, when commenting on Phil Dowe's theory of causation, which is the best-developed causation-as-transmission view, Raatikainen (2018, 40) concludes that "it is undeniable that Dowe's theory directly applies only in the domain of fundamental physics." Therefore, it is unwarranted to assume that the causation-as-transmission view is a universally valid theory of causation, particularly regarding its suitability for assessing the causal efficacy of mental states.

The second problem is that if causation is assumed to require the transfer of a physical magnitude, the theory effectively presupposes that mental states cannot be causally efficacious unless they are identical to physical states. This presupposition, according to Dowe himself, requires a commitment to reductionism. Consequently, the exclusion argument becomes circular and incapable of supporting reductive physicalism over dualism or non-reductive physicalism (Raatikainen 2018).

Raatikainen regards the causation-as-transmission view as an "outdated idea" of causation (2010, 351) and favors James Woodward's interventionist theory of causation instead. This theory is a modern version of the counterfactual theory of causation—and thus a version of the causation-as-dependency view—and has proven to provide a successful framework for understanding causation in many special sciences. It approaches causal relationships from the perspective of manipulation: a causal relationship exists when we can manipulate one factor (the cause) and observe a change in another factor (the effect). Thus, causation is not a matter of a necessary sequence of events (in which some physical magnitude is transferred) but is based on causal dependency that can be revealed through interventions. This provides a practical definition of causation: if changing the cause alters the effect, there is a causal relationship.

In the interventionist theory, mental states can be causally efficacious if they meet the theory's criteria for causal dependency (Raatikainen 2010; 2015; 2018). For instance, if a person's desire to drink water changes and this change leads to physical action — such as reaching for a glass — this shows that the desire has causal relevance. The mental state functions here as a "difference-maker" alongside physical events without transferring energy or any other physical magnitude. This perspective challenges the exclusion argument's claim that mental states are causally inefficacious or have no causal relevance. What is particularly noteworthy in this argumentation is the distinction between the causes of an event, which are determined by causal dependency relations, and the physically sufficient conditions for an event to occur. Indeed, Raatikainen criticizes the exclusion argument for conflating these two notions. In the interventionist theory, these two aspects are separate because an event can have simultaneously both sufficient reasons to exist at a physical level and a causally relevant "difference-making" cause at the mental level.

Based on the interventionist theory, Raatikainen presents three arguments for why the exclusion argument is unsuccessful. The *proportionality argument* (2013; 2015) claims that mental states are causally efficacious, even when the underlying physical state suffices to explain the event. This is because causes and effects should be proportional: physical states are often too precise or complex to explain behavior, whereas mental states are closer to the level of the effect and, therefore, can provide a better explanation for our actions. It is also often the case that even if a physical state changes, the mental state can remain a cause of a bodily behavior, providing a more accurate explanation of the effect. Thus, the proportionality argument suggests that mental states can be genuine causes—understood as causal dependencies—even when the physical state is a sufficient cause in a physical sense.

Raatikainen (2013; 2015; 2018) also criticizes the exclusion argument's implicit assumption that mental and physical causes for an effect together would bring about causal overdetermination. From the perspective of the interventionist theory, overdetermination occurs only if two causes can be manipulated independently of each other and a change can be observed in the effect in both cases. However, according to non-reductive physicalism as assumed by the exclusion argument, mental states supervene on physical states. Hence, the independent causal examination of mental states is impossible: we cannot change a mental state without simultaneously changing the physical state. Therefore, within the interventionist theory, mental and physical states cannot lead to overdetermination. As a result, the soundness of the exclusion argument is, to say the least, questionable (Raatikainen 2015, 188).

Raatikainen's (2015) third argument against the exclusion argument in the context of the interventionist theory targets the causal exclusion premise, according to which a physical event can have only one causally sufficient cause (if we exclude the cases of overdetermination). Raatikainen emphasizes that in the context of interventionist theory, this premise is mistaken. He illustrates the issue with J. L. Mackie's (1965) example of a fire in a house, in which it was concluded that a short circuit, oxygen in the air, and flammable material are causally relevant for the fire to occur. None of these causes excludes the others because manipulating any of these factors affects whether the fire occurs. Thus, in the interventionist theory, multiple causes can be causally efficacious without resulting in causal overdetermination. This conclusion challenges Kim's exclusion premise and opens the possibility that mental states can be causally efficacious alongside physical causes without one excluding the other.

Observations on Raatikainen's critique

Raatikainen's critical analysis of the exclusion argument seeks to show that the argument fails in the context of any theory of causation. From the perspective of the causation-as-transmission view, the argument becomes circular, as it assumes from the outset the exclusion of mental causation. In contrast, within the context of the interventionist theory that Raatikainen supports, the premises of the exclusion argument—such as the claim that an event can only have one cause—are incorrect.

The interventionist theory offers a solution to the problems posed by the exclusion argument, as it allows mental states to be causally relevant without requiring them to be identical to physical causes.

This critique has sparked counterarguments. For example, Bram Vaassen (2021) examines Raatikainen's claim that exclusion arguments misuse the concept of causal sufficiency. According to Raatikainen, genuine causes are difference-makers, whereas causally sufficient phenomena are not necessarily causes. For example, a short circuit alone does not cause a fire, just as a thrown stone does not break a window without additional factors (such as the stone's mass and the window's fragility). Vaassen (2021, 10346) proposes replacing the concept of causal sufficiency with physical sufficiency, by which he means "any possible world in which the same fundamental laws of physics as in our world hold." After replacing causal sufficiency with physical sufficiency, Vaassen reformulates the exclusion argument and argues that mental causation does not happen under these terms.

There are also reasons to question the soundness of some of Raatikainen's arguments within the context of interventionist theory. For example, his interventionist solution can be criticized because it appears to assume the causal efficacy of mental states from the outset (at least sometimes). In fact, avoiding the conclusion that mental states have causal powers is nearly impossible: Since mental states supervene on physical states in non-reductive physicalism, mental states gain causal efficacy in the physical world by virtue of the physical states they supervene on. Similarly, every time a mental state changes, by definition, the underlying physical brain state also changes. Hence, different mental states have different causal effects; there are no situations in which a mental state changes, but its causal effects would remain the same. These points raise the question of whether the interventionist theory sidesteps the problem of free will by defining causation in a way that anticipates the desired conclusion. Recall that Raatikainen criticizes Kim's view of causation because it makes the exclusion argument circular. Here, a similar critique appears to apply to his own solution to the exclusion argument based on the interventionist theory.

Raatikainen's critique, which targets the premise that causal overdetermination must be excluded, raises a different concern. In non-reductive physicalism, changes in mental states are impossible without changes in physical states. For this reason, Raatikainen argues that the entire question of overdetermination is meaningless in this context. This critique, however, can be turned on its head because it implies that the causal efficacy of mental states cannot be empirically tested within the framework of interventionist theory. The problem of empirical testability arises because mental states, supervening on physical states, cannot be manipulated without affecting their physical basis. This is a problem for interventionist theory since it requires variables to be independently manipulated (see, e.g., Baumgartner 2018).

The above counterarguments to the interventionist solution to the exclusion argument highlight a more fundamental issue: interventionist causation theory does not offer a satisfactory answer to the traditional problem of free will. This claim

may seem surprising, given the theory's success in many special sciences, including research on the human mind. Since the most typical difference-making causes of our actions are often intentional and psychological — that is, our mental states are perhaps the most closely correlated with our actions — interventionist theory would appear to provide a particularly suitable framework for examining free will.

Upon closer inspection, however, the interventionist theory does not resolve the problem of determinism, which many regard as central to the issue of free will. This is because the interventionist solution accepts multiple levels of causal explanation (Woodward 2008). Mental and physical causation operate at different levels, and there is no direct competition between them in their role as causal explanations. Mental states are causally efficacious at the psychological level, and physical events are causally efficacious at a physical level, such as the neurophysiological level, without these levels excluding each other.

This theory and Raatikainen's arguments have the merit of providing an account of mental causation that allows us to understand mental states as causally efficacious. Unlike contemporary compatibilists, who seek to reconcile determinism and free will by offering a concept of free will that is compatible with determinism, Raatikainen's solution is based on reevaluating the concept of causation.

However, since this solution is conceptual, it does not alter the nature of events at the physical level. This observation aligns with Vaassen's critique: even if we agree with Raatikainen that the exclusion argument conflates the concepts of causal sufficiency and cause, his account does not change what occurs at the physical level. While Raatikainen does not emphasize the conceptual nature of the interventionist solution, he would likely accept this assessment. This speculation is supported, for example, by his acknowledgment that the causation-as-transmission view may function at the level of fundamental physics.[2] Furthermore, when presenting his proportionality argument, Raatikainen (2013, 152–153) notes that from an interventionist perspective, "at least in some ways of conceptualizing the situation," the physical state is not the cause of a behavior, thus emphasizing the conceptual nature of his solution.

In short, and in relation to the question posed by the title of this article, the preceding means that based on his arguments, Raatikainen could not have acted differently. For instance, he could not have written otherwise and defended the exclusion argument in his articles.

[2] Raatikainen (2010, 351–352) also points out that the concept of causation is problematic in fundamental physics. However, some of the arguments he discusses rely on the interventionist theory, which does not provide impartial support for the claim. This is because the laws of fundamental physics are temporally symmetric, implying that causal relationships consistent with them would also be temporally symmetric. In contrast, under the interventionist theory, this is not the case: for instance, a fire is not a relevant factor in the occurrence of a short circuit.

Scientific epiphenomenalism

Varieties of scientific epiphenomenalism

The second central theme in contemporary discussions on free will concerns scientific epiphenomenalism. It originates particularly from the experiments conducted by Benjamin Libet and his colleagues starting in the late 1970s. These experiments challenged the traditional view of the causal role of conscious will in action, since the results suggested that neural processes associated with an action begin before a person becomes aware of deciding to act. If true, conscious intention does not (always) initiate action; instead, actions begin before conscious decisions are made. Hence, conscious decisions and intentions would be epiphenomenal in relation to the corresponding actions.

Scientific epiphenomenalism has received further support from new experimental findings over the past few decades. Some studies continue in the footsteps of Libet's experiments. For example, in a study by Chun Siong Soon and colleagues (2008), participants were asked, similar to the Libet experiments, to move their hand, but this time to press a button with either the left or the right hand. The results showed that brain activity indicates which hand the participant will use to press the button several seconds before the participant consciously becomes aware of their decision. These experiments support the idea that conscious decision-making is not the causal source of action; decisions are formed unconsciously in the brain before consciousness comes into play.

The challenge to free will has also expanded to include other types of research. For instance, David Milner and Mel Goodale's (1995) studies on the ventral and dorsal streams of the visual system—two pathways in which visual information processing can proceed—suggest that actions based on visual information do not necessarily require conscious visual experience. Daniel Wegner (2017), in turn, argues that the experience of free will itself is a kind of cognitive illusion, where conscious will is not causally effective. Instead, actions are determined by the brain and social factors.

In summary, Libet's studies now represent just one piece of evidence utilized to contest free will. Because scientific epiphenomenalism relies on neuroscientific studies, its forms vary depending on the experiments and results examined. Nonetheless, despite the differences among the studies, they communicate a consistent message: the nature of action and decision-making is not how it appears to be. Most of us believe that our conscious mind guides our decisions and actions, but these studies suggest this belief is mistaken.

It is important to note that these studies do not directly address the issue of free will, but focus on mechanisms related to decision-making, intentional action, and the conscious experience of these processes. Thus, the philosophically intriguing challenge lies in how these findings about mechanisms connect to the concept of free will.

Raatikainen's critique of the interpretation of Libet's experiments

Raatikainen (2015) presents three criticisms of Libet's interpretation of his experimental findings. For this reason, it is necessary to examine more closely what Libet's experiments measured and how these results were interpreted.

Libet aimed to investigate the temporal relationship between two types of cortical neural processes, namely, those related to conscious intention and voluntary action. In his experiments, participants looked at a clock face, where the hand (or a light) made a full rotation in about two and a half seconds. They were instructed to follow the clock hand and freely bend a wrist or a finger whenever they felt the urge to do so. Additionally, they were asked to report the exact position of the clock hand when they decided to bend their wrist or finger. Simultaneously, the electrical activity in their brains was measured using an electroencephalogram (EEG), which recorded activity in the motor cortex. Libet was particularly interested in the so-called readiness potential (RP, a slow negative shift in EEG readings) because it was known to occur when we make voluntary movements.

The results showed that the readiness potential began, on average, 550 milliseconds before the hand or finger movement. However, participants reported deciding to move their hand or finger only 350 milliseconds after the readiness potential had started, that is, about 200 milliseconds before the movement itself. In other words, brain activity was already underway significantly before participants decided to move. Libet interpreted these results as evidence that decision-making is not governed by conscious (free) will but results from unconscious brain processes.

This interpretation is supported by the difference in the readiness potential observed in Libet's experiments between voluntary and forced actions. Specifically, the EEG readings of participants who acted upon hearing a signal—such as bending their finger automatically after hearing a tone—did not show a readiness potential. Since readiness potential was present when subjects bent their fingers without being prompted by an external signal, Libet concluded that it is specifically linked to decision-making rather than automatic, forced, or reflexive actions.

Raatikainen presents three critical comments about Libet's findings and what can be concluded from them. First, he points out that the actions performed in Libet's experiments—moving a wrist or finger—are fundamentally different from the actions typically associated with the problem of free will. The actions in the experiments do not correspond to the complex, deliberative decisions requiring conscious reflection that we make in everyday life. Raatikainen emphasizes that, whereas such decisions take time and involve thorough consideration, the decision-making in Libet's experiments occurs (seemingly) instantaneously. Alfred Mele (2014) agrees with this point and concludes similarly to Raatikainen that Libet's experiments do not provide sufficient grounds to question the existence of free will at a more general level.

Second, Raatikainen criticizes the interpretation of Libet's results from the perspective of theories of causation. The problem lies in the implicit assumption that because something occurs in the brain before a conscious decision, this earlier event somehow excludes the causal efficacy of the later conscious decision. According to

Raatikainen, such an interpretation would lead to absurd conclusions. For example, throwing a stone could not be considered the cause of a window breaking because the stone-throwing itself is always preceded by some event that causes it. He contends that, based on this rationale, only the Big Bang as the first event could be regarded as the cause of later events.

Finally, Raatikainen questions the causal relevance of the readiness potential for the decisions made. This critique concerns the assumption that an unconscious readiness potential would precede every decision we make.[3] Given the assumption, the point Raatikainen makes is the following: if every decision—such as the choice between coffee, taking a walk, or watching a movie—were preceded by the same or similar readiness potential, this potential would not explain which option we choose, as it would occur regardless of the decision made. Thus, according to Raatikainen, the readiness potential cannot be a causally relevant factor for our actions.

Observations on Raatikainen's critique

Raatikainen's critique is ultimately unconvincing because it fails to consider the background from which scientific epiphenomenalism arises. In other words, it does not consider the context in which cognitive and neuroscientific research is conducted, nor how this context affects the interpretations of research findings.

Starting with the critique of the generalizability of Libet's experiments, Raatikainen correctly highlights the difference between decision-making in everyday situations and those faced by Libet's participants. In everyday situations, the things we decide on are often complex and require considerable deliberation, which takes time, whereas this is not the case for the subjects of Libet's experiments. However, one should not confuse the deliberation processes and the act of decision-making. Even if the first one is complex and takes time, the decision that leads to action could happen almost instantly. Thus, although the generalizability of Libet's findings to everyday life is not straightforward, the temporal difference that Raatikainen emphasizes between the decision-making in Libet's experiments and that in everyday contexts is not necessarily significant. In both cases, a decision is made, and Libet's experiments specifically addressed the moment of decision-making, not the deliberation preceding it.

Moreover, Libet's findings are further extended by the research of Soon and colleagues (2008), in which participants were asked to make a simple choice between pressing a button with either their left or right hand. Participants could freely choose which hand to use and then press the button. Brain activity was monitored using functional magnetic resonance imaging (fMRI). The results showed that the activity in specific brain areas could predict with 60 percent accuracy which hand

[3] Although this assumption is rarely explicitly stated, it is typically accepted by those who endorse scientific epiphenomenalism. This is because if it is rejected, then some of our actions could result from conscious decisions rather than preceding brain activity. That is, scientific epiphenomenalism would hold for some actions—something acceptable to most people—but our free will would be "safe" because there are actions that we freely choose to do.

the participants would choose up to 7–10 seconds before they made a conscious decision. Although the choices made in this study were still simple, unlike in Libet's experiments, this task required participants to choose between options. Yet unconscious brain processes, which researchers regarded as being associated with the decision, were active long before the conscious decision. Furthermore, in more everyday contexts, deliberation processes are likely influenced by additional factors. From the perspective of scientific epiphenomenalism, Richard E. Nisbett and Timothy DeCamp Wilson's (1977) findings are particularly interesting, as they suggest that we are often unaware of the basis of our conscious decisions and instead construct explanations retrospectively when asked.

Raatikainen's second critique is correct on a general level: if we deny the potential causal efficacy of phenomena occurring between the readiness potential and the resulting action, we risk ending up in an untenable situation where no event after the Big Bang could be the cause of subsequent events. However, the issue can also be examined from the perspective of the interventionist theory, which Raatikainen prefers. Suppose Libet's findings are accurate and that the readiness potential precedes every consciously made decision and is absent in the contrasting case of "forced" action. In that case, it is reasonable to claim that manipulating the readiness potential (for example, by inhibiting it with a magnetic pulse) would prevent participants from moving their hands or fingers. Therefore, within the framework of the interventionist theory, readiness potential can be considered a causally relevant factor in explaining participants' actions. In contrast, the causal relevance of conscious decision-making has not yet been experimentally demonstrated, and if our earlier analysis stands, it cannot be demonstrated.

Raatikainen's final critique was that readiness potential is not a causally relevant factor in explaining our actions because it does not explain choices, such as deciding between coffee, taking a walk, or watching a movie. This critique, however, can be addressed in at least three ways, two of which have already been discussed above. First, it is reasonable to distinguish the deliberation processes from the decision-making processes. Libet's experiments targeted only the moment of decision-making, and it is therefore unclear why the readiness potential should explain our choice between coffee and walking, for example. Therefore, while Raatikainen's observation is valid, it does not invalidate the significance of Libet's findings. Second, Raatikainen's claim that readiness potential is not a causally relevant factor in explaining our actions is questionable within the interventionist framework. As noted in response to his earlier critique, if Libet's results hold, manipulating readiness potential would influence behavior. Third, Raatikainen's (2015, 193, my translation) argument was based on the claim that "a similar readiness potential precedes all choices (such as going for a walk or to the movies)." This claim about the similarity of readiness potentials is important to his argument since if it were true, the readiness potential would not be a causally significant factor in explaining our specific choices. However, it is unclear why the same readiness potential would precede all choices, nor does Raatikainen justify this claim.

When assessing the last, unjustified claim, it is crucial to recognize that readiness potential is measured using EEG, which records electrical brain activity through electrodes placed on the scalp. The activity of individual neurons is not strong enough to be detected by this method. Rather, detecting readiness potential requires the synchronized activity of thousands or millions of neurons, and the recorded readiness potential does not differentiate between the roles of individual neurons or neuron groups in decision-making or movement preparation. This means that readiness potentials could well reflect our choices — that is, they may differ for different choices and actions — but our current methods cannot differentiate between the neuron groups activated in decision-making. This interpretation is supported by the assumption, which both reductionist and non-reductionist physicalist frameworks accept, that different mental states (e.g., choices) manifest as differences in brain activity.

In conclusion, based on the interpretation of Libet's findings and the above considerations, decision-making appears to be determined by unconscious processes. Thus, Raatikainen could not have refrained from writing his articles. However, the content of those writings might have been different, as Libet's experiments did not address the deliberation preceding decisions. As a result, Raatikainen could have also defended the exclusion argument, provided that Soon and colleagues' findings are not generalizable to more complex situations than those in their experimental design. Furthermore, regarding the findings of Soon and colleagues, it is worth repeating that the prediction accuracy was at most 60% and other times even lower. Given that a random guess would be correct 50% of the time, the reported accuracy is relatively modest. Therefore, it cannot be justifiably concluded from that study that our future decisions are predetermined.

Moreover, this examination of Libet's experiments would be incomplete without mentioning that not just their interpretation but the findings themselves are problematic according to current knowledge (for a recent review, see Dominik et al. 2024). For instance, readiness potential does not precede all voluntarily made actions. Additionally, EEG data analysis is problematic, as voluntary actions occur more frequently during certain phases of brain activity lasting a few seconds. As a result, when EEG data are "summed," the readiness potential appears to begin at least 200 milliseconds earlier than it actually does (Jo et al. 2013). Considering also that in Libet's experimental setup, the decision to move the hand appears to occur later than it does in reality, the conscious decision and readiness potential occur almost simultaneously. Consequently, the claim that unconscious processes preceding actions determine actions is no longer tenable — Raatikainen might have written nothing about free will in the first place.

Summary

The question of free will is one of the most classical and contested issues in philosophy. In recent decades, the discussion has centered on two key themes: Kim's exclusion argument and the scientific epiphenomenalism inspired by Libet's experiments. Raatikainen has addressed both themes but focused mainly on the exclusion argument. He has aimed to demonstrate that the argument fails within the framework of any theory of causation. The causation-as-transmission view favored by Kim renders the argument circular, while the assumptions underlying the exclusion argument are flawed in the context of the interventionist theory of causation. Raatikainen has engaged less extensively with Libet's experiments, but he is critical of the generalizability of the results and the causal relevance of the readiness potential.

I have presented critical observations regarding Raatikainen's solutions to both themes in this paper. Concerning the exclusion argument, I argued that the interventionist theory fails to address the traditional problem of the determined nature of our actions and renders it impossible to test whether mental states are causally efficacious. Furthermore, I suggested that the solution relies on an assumption that presupposes its conclusion, similar to how Kim's understanding of the exclusion argument relied on the causation-as-transmission view of causation, as criticized by Raatikainen. As for Libet's experiments, I contended that Raatikainen's critique is problematic in three ways, as it does not take into account the context in which the studies were conducted, nor how this context affects the possible interpretations of the results. Nonetheless, this is unlikely to substantially alter the situation as regards scientific epiphenomenalism, as the results of Libet and Libet-style experiments are nowadays regarded as problematic, irrespective of how they are interpreted.

If my critical claims about Raatikainen's view on the exclusion argument are sound, then it is reasonable to doubt whether he could have written differently than he did. The challenge from scientific epiphenomenalism does not constrain the act of writing, however. The final twist in the narrative lies in the observation that people tend to exhibit compatibilist intuitions when presented with concrete scenarios, and many believe that individuals are morally responsible in concrete situations where they could not have acted otherwise (Nichols 2011). Hence, given that the topic of this paper has not been some abstract scenario but Raatikainen's extensive work on the question of free will, which has enriched and expanded the discussion on the topic, I believe he deserves praise for this work (too), regardless of whether he might have written differently.

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