

Peer Review

Review of: "The Interaction Problem and Mental Causation: A Quantum Field Theoretical Perspective"

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Marco Masi's article "The Interaction Problem and Mental Causation: A Quantum Field Theoretical Perspective" ambitiously attempts to reconcile dualist notions of mind with contemporary physics, using the language of quantum field theory (QFT). The paper's chief strength lies in its clarification of terminology and concepts drawn from modern physics – particularly QFT – as they pertain to causation and interaction. In the first part of the article, Masi usefully disentangles terms like "material," "immaterial," "physical," "unphysical," and "interaction," showing that these notions are far more nuanced in a QFT context than in classical mechanics. For example, he discourages the simplistic Cartesian division of mind as "immaterial" versus body as "material," noting that in modern physics the distinction between entities with mass and those without (massive vs. massless quanta) is commonplace and poses no fundamental conceptual barrier. Similarly, he underscores that what counts as "physical" should not be confined to what occupies tangible space or obeys deterministic laws in the classical sense, since quantum physics operates with very different principles of causality and space-time. The article highlights that quantum interactions – depicted as field couplings via exchange of virtual particles – dissolve the old notion of contact mechanics, and even the idea of a localized "collision" must be rethought. This clarificatory work is well-executed. Masi's exposition of QFT principles (such as the interaction-independent nature of field coupling and the unified ontological status of "substance" and "interaction" in QFT) indeed provides a valuable perspective for non-physicists grappling with mind-body debates. One comes away from the first part of the paper with a deeper appreciation that terms like *interaction*, *cause*, and *physical* carry specific meanings in modern physics that do not straightforwardly map onto their everyday or classical usage. In this respect, the paper does a commendable job of

“speaking a very different language” of modern physics to clarify semantic ambiguities in the mind-body discourse.

However, the article’s virtues in clarifying physics terminology are overshadowed by serious conceptual leaps and a speculative treatment of mental causation in its latter parts. The transition from physical theory to claims about mind and consciousness is problematic on multiple levels. Masi’s central proposal is that quantum indeterminism might permit a form of mental causation without the exchange of physical forces – what he terms a kind of “causality without interactions.” Specifically, he suggests that a *mental agent* (suddenly introduced in the narrative without prior definition) could exert a “conscious causal power” by selecting or permuting the sequence in which quantum events occur, thereby actualizing one particular history among the many possible quantum histories. In Masi’s words, this involves “shifting the causal principle of a mental agent... from interactions based on physical forces to a conscious causal power that engages with potentialities – specifically, the temporal ordering of quantum microphenomenal events – [which] constitutes a form of causality that selects and actualizes a path from a set of many possible histories”. He argues that this selection mechanism follows “the same stochastic quantum principle underlying the scattering processes with many possible histories”, yet operates without any conventional physical interaction or exchange of energy. By mere *volition*, the mental agent is said to “permute the time series of actualizations from a specified set of potentialities”, presumably allowing mind to influence matter while miraculously respecting conservation laws and the statistical structure of quantum outcomes. Masi labels this notion “*combinatorial causality*,” emphasizing that it “does not alter the frequency of outcomes and, therefore, does not affect the wave function or its associated probability function” – thus ostensibly avoiding any violation of physical laws or observable statistical shifts.

This proposal, however, is fraught with conceptual obscurity and unsupported assumptions. Foremost, the paper provides no clear **operational or ontological account** of the putative “mental agent” or its “conscious causal power.” The appearance of this *mental agent* is abrupt and unexplained – a kind of *deus ex machina* inserted into the quantum formalism. We are never told what this agent is, in physical or metaphysical terms, nor how an agent’s **volition** could physically constrain the order of quantum events. The author moves from describing quantum processes in impersonal terms to suddenly ascribing to “volition” the ability to choose outcomes, without ever bridging that explanatory gap. This is a **tremendous conceptual leap**: it presumes that consciousness can be treated as an actor on the quantum stage, picking among probability-weighted possibilities, yet **no justification or mechanism** for this

presumption is given. The absence of any model or even speculative description of *how* a mind might interact with quantum states to effect such a selection renders the account nebulous. The reader is left wondering: by what means does the mind “permute” quantum event sequences? What is the ontological status of this mind – is it a non-physical entity, a novel field, an aspect of quantum reality? Masi avoids calling it a force or a physical interaction, but then **what is it?** The paper offers only the label “conscious causal power,” which is not an explanation but rather a rebranding of the mystery.

Crucially, invoking the stochasticity of quantum mechanics as an analogy or substrate for mental choice **does not succeed in illuminating mental causation**. Quantum indeterminism – the idea that certain events have no specific cause and happen randomly within probabilistic constraints – is *not* an explanatory model of volition or consciousness. A genuinely **random choice among outcomes**, which is what quantum mechanics entails in the absence of hidden variables, is the opposite of an agentive, purposeful decision. Masi’s argument seems to conflate the *openness* of quantum outcomes (the fact that multiple futures are possible) with the *freedom of will*, but this conflation is misguided. If a “mental agent” were merely exploiting quantum randomness to choose among brain-state outcomes, the choice would be **stochastic** by his own admission, “limited only by the laws of quantum physics that determine the probability function”. By definition, a stochastic or random selection does not align with what we typically mean by conscious choice or free will, which implies some **reason or intention** behind selecting one course over others. As the review under discussion rightly points out, a *random decision* is not recognized as a manifestation of free will by psychology, philosophy, or law. In fact, equating free will to quantum randomness would strip agency of any **rational or volitional character**, reducing it to chance. Masi does hint at “volition” guiding the selection, but if this volition does not bias the statistical outcomes (so as to preserve the quantum probability distribution), then effectively the “choice” is indistinguishable from random happenstance. The author thus finds himself in a bind: either the mental agent’s choice is *lawfully* correlated with certain outcomes (in which case it *does* skew probabilities or introduce new parameters, potentially conflicting with physics as we know it), or it does nothing beyond what random quantum fluctuations already do (in which case it fails to account for the perceived efficacy of conscious decisions). The paper avoids confronting this dilemma by asserting that the interaction problem “does not arise” because under this scheme no conventional force is exchanged. But this is a non sequitur: **the core of the interaction problem is not merely about force exchange, but about how mental and physical domains can be coherently linked**. Declaring that a mental cause doesn’t exchange energy

like a physical force does not dissolve the mystery of mental causation – it merely restates that mystery in quantum-theoretical jargon.

In addition to these conceptual issues, the article suffers from a lack of engagement with **existing science and scholarship on consciousness**. Masi's narrative operates in near-total isolation from empirical neuroscience and well-established theoretical models of mind. There is a conspicuous absence of references to contemporary cognitive science or neurobiological research on consciousness and decision-making. This lacuna is glaring: any serious account of mental causation should, at minimum, acknowledge the robust frameworks that already exist (for example, motivated emotional mind, global workspace theory, integrated information theory, or predictive processing, to name only a few), or the extensive empirical knowledge about neural circuits underlying volitional action. Masi's failure to discuss such approaches gives the impression that the paper's speculative hypothesis has not been tested against what is already known about the brain and behavior. Even within the philosophy of mind, the article does not adequately situate itself. It neglects the extensive literature on non-reductive physicalism, emergentism, and **mind-brain supervenience** that any account of mental causation must contend with. While the author cites Jaegwon Kim's work in a historical context, he does not address Kim's well-known arguments concerning the **causal exclusion problem** and the demand for *identity or reduction* of mental properties to physical properties if mental causation is to be intelligible. Kim and others have persuasively argued that unless mental states are in some sense identical to or at least *determined by* physical states, any purported mental influence on physical outcomes risks either violating the causal closure of physics or lapsing into epiphenomenalism. Masi's proposal offers no discussion of whether mental states are ultimately physical or not, sidestepping a central issue of the interaction debate. Indeed, the very strategy of appealing to quantum mechanics begs the question: *Is the author suggesting that mental states are quantum states or rooted in quantum processes in the brain?* If so, this starts to resemble a type of reductive explanation (along the lines of quantum neuroscience hypotheses), in which case established neurophysical models ought to be considered. If not – if the mind remains an ontologically distinct, non-physical "agent" – then invoking quantum principles does not evade the classic interaction problem at all; it merely transposes it to the quantum scale. In either case, the article's avoidance of positions like **mind-brain identity theory or supervenience** is a serious omission. The reader is left without any clarity on how Masi's view relates to mainstream viewpoints: is he advocating a form of dualism that piggybacks on quantum indeterminism, or a form of physicalism that places consciousness

at the quantum level? The **ontological ambiguity** is profound and undermines the plausibility of the account.

The language and reasoning in the paper further invite critique. At times, Masi's use of physics concepts borders on **category error or metaphorical excess**. His assertion that "the causal structure is defined by differential equations that determine the dynamical evolution of a system's physical state" exemplifies a subtle but important problem. Physical theory uses differential equations (such as Schrödinger's equation) to *model* the evolution of systems, but it is misleading to say these equations **define** or **dictate** causality itself – as if the mathematics were the agency behind physical processes. Equations describe regularities; they do not *cause* those regularities. Masi's phrasing suggests an almost **Neoplatonic reification** of mathematics, echoing a view that because an equation exists on paper, it "makes" the electron move as it does. This is putting the cart before the horse. In reality, the equations are human descriptions of nature's behavior; the causal structure is in nature, not in our representations. While this might seem a minor linguistic quibble, it points to a tendency in the article to blur the line between physical reality and theoretical description, a confusion that carries over into the attempt to use physics as a metaphor for mind. In a similar vein, the paper speaks of Nature perhaps "choosing" outcomes at the quantum level – a teleological turn of phrase that might be intended poetically, but further muddies the discussion by anthropomorphizing physical processes. These choices or "self-causal" aspects of quantum phenomena remain entirely within the realm of physics (and are better understood as randomness or inherent indeterminacy), yet Masi uses them as a springboard for a teleological, mentalistic narrative. The risk here is that physical theory is being used as a metaphorical template for mental phenomena without warrant, an approach that can mislead more than it illuminates. For instance, scattering amplitudes and quantum "histories" are well-defined concepts in particle physics, but treating a conscious decision as analogous to a particle scattering event is a speculative stretch. The paper offers no justification for why the mind's activity should resemble a sequence selection among quantum amplitude-defined histories, apart from a loose structural analogy. Such analogies remain entirely unsubstantiated: the author does not derive mental properties from physics, nor does he propose experimental ways to connect consciousness to quantum event sequencing. The result is that physics stays at the level of metaphor for mental causation, rather than providing any concrete explanatory mechanism.

Perhaps the most problematic aspect of Masi's proposal is its excursion into what he himself calls "**metaphysical**" territory – notably the suggestion of a "**libertarian quantum panpsychism**." After

introducing his combinatorial-causality idea, Masi acknowledges that one could interpret it in a panpsychist vein: “all quantum processes in the universe might be fundamentally grounded in proto-mental choices” – an outlook he terms *libertarian quantum panpsychism*. He assures the reader that “nothing in the known laws of physics prevents us from entertaining such metaphysical speculation.” This is certainly true – physics does not forbid metaphysical speculation – but the fact that a speculation is physically unprohibited does not amount to an endorsement of its plausibility or value. The invocation of panpsychism here dramatically raises the stakes of the paper’s claims while simultaneously underscoring their lack of empirical grounding. Panpsychism – the idea that consciousness (or proto-consciousness) is a fundamental feature of all matter – is a highly contentious philosophical position, and adding “libertarian” (implying indeterministic free will at the ground level of reality) only intensifies the controversy. To adopt such a stance, even tentatively, is to depart from science into speculative metaphysics without a safety net. Masi offers no evidence for this deep ontological commitment; it is presented as a tantalizing interpretation, a *possible* way to see his quantum mind-causation link. But without rigorous argument or evidence, the introduction of libertarian panpsychism comes across as a **metaphysical leap of faith**. It also isn’t clear what explanatory power this notion provides. If every quantum event involves a “proto-mental choice,” does that actually help elucidate human consciousness, or does it merely relocate the mystery of mind to the subatomic scale? The article does not spell out how panpsychism would make the mind-body interaction more comprehensible – it merely suggests that perhaps mind-like properties are everywhere, and thus our minds can influence matter because matter too has mind-like aspects. This is *philosophically intriguing* but extremely underdeveloped in the text. Without engaging with the **rich literature on panpsychism** (for example, the works of Strawson, Goff, etc., none of which are cited), Masi’s nod to “proto-mental choices” remains an isolated conjecture. Furthermore, the term “libertarian” in this context hints at an endorsement of contra-causal free will at the fundamental level. Embracing such libertarian free will is itself a controversial philosophical move, one that would require grappling with centuries of debate on free will, determinism, and indeterminism – another discourse the paper entirely sidesteps. In sum, the notion of “combinatorial causality” underwritten by “libertarian quantum panpsychism” is **extraordinarily speculative**, resting on heavy metaphysical assumptions that find no support in current scientific knowledge. It is one thing to speculate beyond current science (philosophy of mind often must), but responsible scholarship demands that this be done with great care, clear definitions, and engagement with existing arguments. Here, by contrast, the speculative idea is introduced almost cavalierly, as if the mere evocation of quantum mechanics grants license to leap over serious philosophical hurdles.

To be sure, there is a long tradition of authors attempting to invoke quantum mechanics to solve the mysteries of consciousness and free will – from the early proposals of Eccles to more recent theories involving quantum coherence in microtubules (Hameroff and Penrose) or indeterminacy in synaptic transmission. Masi is clearly aware of this tradition and cites several such proposals. Yet, his own perspective does not meaningfully engage with or advance those ideas; instead, he claims his view “does not compete with such outlooks; rather, it could complement them”. This complementary stance is never elaborated: we do not learn how, for instance, a “conscious causal power” selecting quantum event orderings would integrate with a model like orchestrated objective reduction, or with any neurobiological substrate. Essentially, Masi’s contribution remains *at the level of an abstract principle*, not a working model. The lack of any concrete link to neurophysiological processes or to established cognitive functions makes the proposal difficult to assess or potentially falsify. In the end, the paper’s attempt at a solution to mental causation amounts to a restatement of the problem in exotic terminology: where once we asked how an immaterial mind could influence the brain, we are now asked to **imagine a mind that influences quantum event** sequencing without altering probabilities. The mystery is not resolved; it is, if anything, rendered more mysterious by being couched in quantum-mechanical terms. By avoiding the hard questions of **reduction vs. dualism** and by failing to propose any empirical avenue to explore the hypothesis, the article lands squarely in the realm of unfalsifiable speculation.

In conclusion, Masi’s article performs a useful service in clarifying how modern physics conceives of interaction and causation, thus warning philosophers of mind to update any antiquated assumptions about what counts as “physical” or “material.” For this, the author deserves credit. However, the paper’s second main aim – to present “a new understanding of mental causation... that reconciles the dualist perspective with the probabilistic nature of quantum mechanics” (p. 1) – remains largely unfulfilled. The proposed quantum-field-theoretic perspective on mental causation is highly conjectural, opaque in its mechanisms, and disconnected from both empirical science and prevailing philosophical accounts of mind. It relies on ambiguous notions (a mental agent with unexplained powers), leans on analogies that do not bear substantive explanatory weight, and introduces metaphysical doctrines (like libertarian panpsychism) that raise more questions than they answer. Crucially, the work does not engage with the burgeoning interdisciplinary research on consciousness, from neuroscience to cognitive science to analytic philosophy, which any credible theory of mind must take into account. In its present form, the article reads more as a speculative essay than a rigorous “*review article*” promised in its header. A more convincing account would require the author to address the **known hurdles** in the mind-body problem:

for instance, by clarifying whether mental states are to be identified with particular physical states or processes (thus embracing a form of **reductive physicalism**), or explaining how a non-physical mind can have physical effects without either violating physics or nullifying itself (a task which many, following Kim, have argued is untenable without reduction). It would also require situating the quantum speculations within a concrete model of neural or cognitive function – or at least indicating what empirical observations might support the idea of minds “permuting” quantum events. Without such clarification and support, the article’s framework remains an intriguing but ultimately insubstantial conjecture. It provides a novel vocabulary for talking about mental causation (borrowed from QFT), but does not provide a satisfying solution to the interaction problem. The critical stance, then, is that while publication might stimulate discussion, the paper in its current state warrants a very modest evaluation. Substantial revision and expansion would be needed for it to make a credible contribution. Integrating the insights of psychologists, neuroscientists, and philosophers of mind – rather than bypassing them – is essential if the author wishes to genuinely bridge physics and consciousness. Only by engaging with the **complexity** of the problem, both scientific and philosophical, can such a quantum-theoretical perspective hope to move from speculative plausibility to a persuasive explanatory model.

References:

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(And the literature cited there)

Declarations

Potential competing interests: No potential competing interests to declare.