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Reply to 'Perils and pitfalls of near-death experience research'

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We thank Dr Engmann for his comments on our recent Review (Martial, C. et al. A neuroscientific model of near-death experiences. *Nat. Rev. Neurol.* **21**, 297–311; 2025)[1], which are valuable (Engmann, B. Perils and pitfalls of near-death experience research. *Nat. Rev. Neurol.* https://doi.org/10.1038/s41582-025-01118-2; 2025)[2]. The concerns about terminology, phenomenological diversity and methodological clarity are important and merit attention. We respond by clarifying and expanding on key ideas from our article[1].

It goes without saying that we fully support Engmann's caution against reducing complex experiences such as near-death experiences (NDEs) to narrow neurochemical mechanisms. This concern echoes the enduring 'hard problem of consciousness', which, as Gomez-Marin and Seth[3] aptly noted, remains far from being fully understood. Although no single model can currently resolve it, we argue that proposing neurochemical hypotheses remains an essential step in the iterative process of scientific inquiry.

We respectfully disagree, however, with the assertion that our NEPTUNE model[1] lacks novelty. Its originality lies in integrating neurophysiological, psychological and evolutionary levels into a coherent, multidimensional framework. Although some components build on prior hypotheses, we provide a complex synthesis and detailed examination of factors such as specific neurotransmitter involvement, hypoxia and stress responses — an integrative perspective that is, to our knowledge, unprecedented. Suggesting a lack of novelty risks overlooking the very principle Engmann[2] invokes in discussing phenomenology and neurophysiology: that the whole differs from the sum of its parts[4].

We concur that the phenomenological diversity of NDEs is substantial, and future work should empirically test our model[1] across a range of NDE and NDE-like contexts, including psychoactive[5] or trance states[6]. However, we feel that cardiac arrest NDEs represent an important and well-defined starting point owing to their high incidence, clinical clarity, representative value and historical role in drawing scientific interest to the phenomenon. As noted in our article, NDEs form a broad continuum shaped by context, physiology and psychology. We also agree that the term NDE is imprecise and is often used as a catch-all. In this situation, standardized tools become even more necessary, contrary to Engmann's suggestion. Despite challenges[7], standardized tools such as the NDE Content scale[6], which has been validated on hundreds of narratives and further developed through recent literature and strong psychometrics, remain essential to empirical research. Although no scale fully captures the subjective complexity of NDEs, we believe that these tools, alongside first-person accounts, best support empirical scientific progress.

Engmann[2] questions the relevance of evolutionary explanations for NDEs, especially given their occurrence outside life-threatening contexts. Although caution is needed, we propose that specific elements, such as atonia or dissociation, might have conferred survival benefits in specific predator-related scenarios. As Peinkhofer et al.[8] note, many behaviours, including yawning and laughing when tickled, are conserved across species despite being beneficial only in particular settings. Our hypothesis suggests a possible but not universal adaptive origin for certain components of NDEs.

We would also like to clarify that our reference to dualistic theories was not an endorsement but a recognition of their historical role in NDE research. Given the longstanding influence of these theories, omitting them would have overlooked an important dimension of the debate. However, as stated in our article, these theories fall outside our empirical focus and belong to domains such as religion and philosophy.

In summary, we welcome critique and agree on the need for continued conceptual and methodological refinement. At the same time, we affirm the value of models such as NEPTUNE[1] as a basis for rigorous NDE research and hope our response fosters further constructive discussion.

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Competing interests

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