Journal of
Scientific Exploration

Anomalistics
and
Frontier
Science

A Publication of the

SOCIETY
FOR
SCIENTIFIC
EXPLORATION

VOLUME 39
ISSUE 3

Fall 2025

Journal of **Scientific Exploration**
Anomalistics and Frontier Science

Platinum, open access journal published quarterly, and continuously since 1987 (ISSN 0892-3310)

Aims and Scope: The *Journal of Scientific Exploration* is an Open Access journal, which publishes material consistent with the Society's mission: to provide a professional forum for critical discussion of topics that are for various reasons ignored or studied inadequately within mainstream science, and to promote improved understanding of social and intellectual factors that limit the scope of scientific inquiry. Topics of interest cover a wide spectrum, ranging from apparent anomalies in well-established disciplines to rogue phenomena that seem to belong to no established discipline, as well as philosophical issues about the connections among disciplines. See Author Guidelines at https://journalofscientificexploration.org/index.php/jse/about/submissions

Journal of Scientific Exploration (ISSN 0892-3310), an open access, peer-reviewed journal, is published quarterly at the end of March, June, September, and December by the Society for Scientific Exploration. Contact https://www.scientificexploration.org/Contact for inquiries.

Journal of **Scientific Exploration**
Anomalistics and Frontier Science

Volume 39, Number 3 2025

EDITORIAL

RESEARCH ARTICLES

BRIEF REPORT

ESSAYS

BOOK AND MULTIMEDIA REVIEW

CORRESPONDENCE

ANNOUNCEMENTS

Journal of Scientific Exploration
Anomalistics and Frontier Science

EDITORIAL

The Möbius Mystery of Being: Are Life and Consciousness Entwined?

James Houran
editor@scientificexploration.org
orcid.org/0000-0003-1725-582X

https://doi.org/10.31275/20253787

Few questions have captivated modern science—and the human imagination—more than the riddle of 'consciousness'. Long confined to philosophy or speculative psychology, the domain of consciousness studies has now surged into mainstream inquiry, galvanizing neuroscientists, physicists, computer scientists, and philosophers alike. What was once dismissed as metaphysical musing is now a central puzzle in our quest to understand mind, matter, and meaning. From the allure of Chalmers' (1995, 2007) 'hard problem' (or "how does mindless matter produce matterless mind?"; Cunningham, 2024, p. 24), to the promises of brain-imaging technologies and artificial intelligence, consciousness has emerged as both a scientific frontier and an existential mirror (e.g., Wahbeh et al., 2022). It is not merely a problem of mechanism, but of identity—and its resolution may unlock not only new knowledge, but new ways of being.

At the same time, the equally profound, and arguably more elemental, mystery of 'life' itself has seemingly receded from the spotlight. In many academic circles, this question now lingers in the background—assumed, bracketed, or treated as a lesser problem—while inquiry rushes ahead to tackle the phenomenology and mechanisms of mind. This shift might nonetheless obscure the deeper foundation on which consciousness rests. *But have we been too eager to explore the mind without first understanding the conditions that make it possible?* Before there is awareness, there is organization, persistence, metabolism—there is life. And perhaps we have been too quick to assume that we understand it, much less its connection to consciousness. It could be argued that life and consciousness may not be separable mysteries but mutually implicating processes—co-arising, co-sustaining, and perhaps co-explanatory.

REVISITING FIRST PRINCIPLES

What is life? And what is consciousness? These are not merely adjacent problems within biology or cognitive science, but existential riddles that seem to underlie much of our inquiry into the nature, limits, and meaning of reality itself. Each question has been declared the 'greatest mystery' by thinkers across traditions, and each currently resists definitive explanation. Yet their relationship is not merely parallel. They might well be entangled: conceptually, empirically, and perhaps ontologically. The question we now face is whether one is more foundational than the other—and what such a distinction would even mean.

To evaluate whether consciousness is more fundamental, we must first consider its current scientific status. At first glance, the case for consciousness as the deeper mystery

is compelling. Consciousness is epistemically prior: it is the medium through which all questions—including that of life—are framed. We must be conscious to observe, reflect, and ask. Despite advances in mapping neural correlates (Dehaene et al., 2017), no empirical theory explains why brain states generate subjective experience. This explanatory gap persists despite advances in models like Integrated Information Theory (Tononi, 2008) and Global Workspace Theory (Baars, 1988/1990). The former posits that consciousness arises from the degree of integrated information within a system, emphasizing internal structure and causality. In contrast, the latter views consciousness as the result of information being broadcast across a network to enable coordinated access by various cognitive processes.

More recently, attempts to quantify consciousness via information-theoretic measures such as Φ (phi) have encountered both enthusiasm and skepticism. Critics distinguish between strong and weak interpretations of IIT (Mediano et al., 2022), while others advocate for pluralistic models that integrate various metrics—such as the perturbational complexity index, Lempel–Ziv compression, and multivariate mutual information (Seth & Bayne, 2022). These efforts underscore the provisional nature of current metrics and the theoretical humility needed when addressing the nature of awareness. Consciousness also may not exist in a vacuum, so we must also account for the biological context in which it emerges.

BEYOND THE GREAT DIVIDE

Could consciousness exist independently of life, or does it always emerge within living systems? As research advances on the mind's deepest mysteries, we risk neglecting the more fundamental question: what scaffolds experience itself? In particular, privileging consciousness risks overlooking the deeper ontological context from which it arises: life. Consciousness, as we currently observe it, arguably exists only within living systems. Several authors likewise contend that, evolutionarily speaking, 'life' precedes 'mind' by billions of years (e.g., Ginsburg & Jablonka, 2019; Godfrey-Smith, 2016; Lane, 2015; Maynard Smith & Szathmáry, 1995). The transition from non-life to life (i.e., abiogenesis) remains one of the most profound and unresolved issues in science. *How does inert matter become self-organizing, adaptive, and self-replicating? And what does it mean, philosophically or physically, for matter to cross that boundary into life?* Despite progress in prebiotic chemistry and synthetic biology, we have no definitive account of how 'life' begins (Szostak, 2012; Walker, 2017).

The thermodynamic perspective introduced by Schrödinger (1992), in which life is seen as a system that maintains order by feeding on negative entropy, remains one of the earliest and most influential attempts to frame this question in physical terms. Gonçalves (2024) has recently expanded this model with a physically principled definition of life centered not on structure but on dynamic behavior—specifically, the self-constrained dissipation of chemical disequilibria. Such approaches recast life as a dynamical system governed by constraint-generation, not merely a biochemical collection of parts.

Moreover, consciousness may be more entangled with life than is typically assumed. Mainstream biology holds that all known conscious entities are alive, yet many living organisms (e.g., bacteria, fungi) exhibit no signs of subjective awareness. This asymmetry hints at life as a necessary—but not sufficient—condition for consciousness. The evolutionary emergence of sentience from non-sentience remains deeply puzzling. Feinberg and Mallatt (2016) suggested that unified mental experience arose alongside complex centralized nervous systems roughly 500 million years ago. Godfrey-Smith (2020), in his *Metazoa* book, extended this view by emphasizing octopus cognition and decentralized intelligence as a challenge to cortex-centric or anthropocentric models.

UNFOLDING THE PATTERNS OF BEING

The thermodynamic reframing of life indeed opens new conceptual territory. By shifting the focus from biological substrates to energetic and informational dynamics, such accounts invite a deeper convergence between the puzzles of life and mind. Consciousness may be one expression of a broader class of systems that evolve through constraint-generation; systems that are not merely complex, but intrinsically self-modifying. This invites us to reconsider whether our deepest questions—about experience, agency, and existence—might find their roots not in neural networks alone, but in the thermodynamic logic of living systems.

Complementing this view is the enactivist framework, which holds that mind arises from the dynamic coupling between organism and environment. Rather than isolating awareness to an internal computational process, enactivism sees consciousness as co-emergent with autopoietic life processes, that is, systems capable of maintaining and

generating themselves. Thompson (2007) and Di Paolo et al. (2018) emphasized the centrality of sense-making and participatory agency in the emergence of mind. Maturana and Varela's (1980) notion of recursive self-production—autopoiesis—offers a compelling link between self-organizing life and the phenomenology of conscious selfhood. From this vantage, life and consciousness are not separate layers but entwined in a mutually specifying loop.

Even more provocative are findings at the edge of life and death. Studies of near-death experiences (NDEs) certainly challenge simplistic life–consciousness linkages. For instance, Parnia et al. (2022) have documented structured brain activity, including gamma bursts, during cardiac arrest—suggesting that some form of awareness may persist beyond clinical death. Indeed, NDEs often occur during severely compromised brain activity states (Kelly et al., 2007; Parnia et al., 2023) that cannot readily account for the vivid, realistic, and veridical perceptions reported. These patterns invite critical examination of reductionist neural explanations and perhaps lend credence to dualistic or nonlocal models of consciousness (e.g., Baker-Hytch, 2025; Barušs, 2023; Greyson, 2000; Weiler & Acunzo, 2024), At the very least, such findings imply that there are blurred lines between biological viability and conscious presence, adding urgency to the life–mind question.

Quantum biology also enters the debate. Hameroff and Penrose's (2014) Orch OR theory controversially posited that consciousness arises from quantum coherence within neuronal microtubules. Though heavily debated, this view is buoyed by evidence of coherence in other biological systems, such as photosynthesis (Lambert et al., 2013) and microtubular resonance (Craddock et al., 2017). These findings suggest that biology may exploit quantum-classical dynamics in ways that potentially support moments of conscious awareness, thus complicating traditional physicalist models.

This question also takes on added significance in the era of astrobiology. If life arises from universal physical or informational principles, might radically different biochemistries—silicon-based life, cryogenic extremophiles, or even plasma-based cognition—be possible elsewhere in the cosmos? As we seek biosignatures and technosignatures beyond Earth, we may soon confront not just new forms of life, but perhaps new forms of awareness—ones that strain or shatter our current frameworks (e.g., Cleland & Chyba, 2002; Davies, 2019).

What might it mean to encounter a consciousness radically unlike our own? Could we even recognize it? The boundaries between living and non-living, conscious and unconscious, may be further blurred by the emergence of synthetic intelligences (e.g., Dennett, 2017). *Could a machine that maintains and evolves its internal constraints—akin to Gonçalves's (2024) 'self-constrained dissipative systems'—qualify as alive?* If so, might such systems eventually support consciousness, not as an imitation, but as a parallel instantiation?

Still, some theories invert this logic entirely. Panpsychism (i.e., the idea that everything in the universe—even tiny particles—has some form of consciousness or awareness) and cosmopsychism (i.e., the notion that the entire universe is one big conscious mind, and our individual minds are like small parts of that cosmic mind) contend that consciousness does not emerge from life—but precedes it (e.g., Goff, 2019). Hunt and Schooler (2019) provided formal models of panpsychism, in which consciousness is a fundamental feature of all matter. Spira (2017) went further, suggesting that the cosmos itself may be a unified conscious entity—a highly provocative view that challenges the assumption that mind arises only from life. These perspectives compel us to consider a distributed, embedded ontology of awareness—where consciousness permeates, rather than emerges.

ONE ENIGMA, TWO FACES

Ultimately, we are left with a deceptively simple question: which mystery runs deeper—life or consciousness? The answer may seem to hinge on one's philosophical vantage. If we ask what renders meaning, perception, and inquiry possible, then consciousness appears fundamental—the very medium of all knowing. But if we ask what gives rise to organization, complexity, and the conditions from which consciousness arises, then life asserts its primacy. Yet this framing may obscure more than it reveals. Rather than ranking these enigmas, we must ask whether they are truly separable at all. *Are we confronting two distinct mysteries—or circling a single, recursive truth still waiting to be fully seen?*

In the end, life and consciousness may not be separate riddles at all, but one bifurcated enigma—an ontological Möbius strip where mind and matter, process and presence, exterior and interior endlessly loop into one another. To untangle one without the other may not simply be difficult; it could be a category error. These are not just scientific puzzles; they are the twin thresholds of understanding, each casting light on the other, each inviting us to rethink what it means to exist.

If we are to take the next leap in understanding, it will not be through narrower theories but through a bolder imagination and broader vision—potentially a framework that dares to unite life and mind, biology and phenomenology, matter and meaning. The task is not only about explaining a mystery, but also about recognizing that we are already inside it. And if we look closely, we may find that the universe is not merely something we observe but something that is also, in some unfathomable way, observing us back.

REFERENCES

Baars, B. J. (1988/1990). *A cognitive theory of consciousness*. Cambridge University Press.

Baker-Hytch, M. (2025). Glimpses into the great beyond? On the evidential value of near-death experiences. *AG-ATHEOS: European Journal for Philosophy of Religion*, *2*, 66–84. https://doi.org/10.69574/aejpr.v2i1.24886

Barušs, I. (2023). *Death as an altered state of consciousness: A scientific approach*. American Psychological Association. https://doi.org/10.1037/0000361-000

Chalmers, D. J. (1995). Facing up to the problem of consciousness. *Journal of Consciousness Studies*, *2*, 200–219.

Chalmers, D. (2007). The hard problem of consciousness. In M. Velmans & S. Schneider (Eds.), *The Blackwell companion to consciousness* (pp. 225–235). Blackwell Publishing. https://doi.org/10.1002/9780470751466.ch18

Cleland, C. E., & Chyba, C. F. (2002). Defining 'life'. *Origins of Life and Evolution of the Biosphere*, *32*, 387–393. https://doi.org/10.1023/A:1020503324273

Craddock, T. J. A., Kurian, P., Preto, J., Sahu, K., Hameroff, S. R., Klobukowski, M., & Tuszynski, J. A. (2017). Anesthetic alterations of collective terahertz oscillations in tubulin correlate with clinical potency: Implications for anesthetic action and post-operative cognitive dysfunction. *Scientific Reports, 7*, Article 9877. https://doi.org/10.1038/s41598-017-09992-7

Cunningham, P. F. (2024). The real 'hard problem' of consciousness: Where do thoughts come from, if not the brain? *Journal of Consciousness Studies*, *31*, 28–54. https://doi.org/10.53765/20512201.31.7.028

Davies, P. (2019). *The demon in the machine: How hidden webs of information are solving the mystery of life*. University of Chicago Press. https://doi.org/10.7208/chicago/9780226669847.001.0001

Dehaene, S., Lau, H., & Kouider, S. (2017). What is consciousness, and could machines have it? *Science*, *358*, 486–492. https://doi.org/10.1126/science.aan8871

Dennett, D. C. (2017). *From bacteria to Bach and back: The evolution of minds*. W.W. Norton.

Di Paolo, E. A., Buhrmann, T., & Barandiaran, X. E. (2018). *Sensorimotor life: An enactive proposal*. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198786849.001.0001

Feinberg, T. E., & Mallatt, J. (2016). The *nature* of primary consciousness: A new synthesis. *Consciousness and Cognition*, *43*, 113–127. https://doi.org/10.1016/j.concog.2016.05.009

Ginsburg, S., & Jablonka, E. (2019). *The evolution of the sensitive soul: Learning and the origins of consciousness*. MIT Press. https://doi.org/10.7551/mitpress/11006.001.0001

Godfrey-Smith, P. (2016). *Other minds: The octopus, the sea, and the deep origins of consciousness*. Farrar, Straus and Giroux.

Godfrey-Smith, P. (2020). *Metazoa: Animal life and the birth of the mind*. Farrar, Straus and Giroux.

Goff, P. (2019). *Galileo's error: Foundations for a new science of consciousness*. Pantheon.

Gonçalves, D. (2024). Rethinking life and predicting its origin. *Theory in Biosciences, 143*, 205–215. https://doi.org/10.1007/s12064-024-00420-9

Greyson, B. (2000). Near-death experiences. In E. Cardeña, S. J. Lynn, & S. Krippner (Eds.), *Varieties of anomalous experience: Examining the scientific evidence* (pp. 315–352). American Psychological Association. https://doi.org/10.1037/10371-010

Hameroff, S., & Penrose, R. (2014). Consciousness in the universe: A review of the 'Orch OR' theory. *Physics of Life Reviews*, *11*, 39–78. https://doi.org/10.1016/j.plrev.2013.08.002

Hunt, T., & Schooler, J. W. (2019). The easy part of the hard problem: A resonance theory of consciousness. *Frontiers in Human Neuroscience*, *13*, Article 378. https://doi.org/10.3389/fnhum.2019.00378

Kelly, E. W., Greyson, B., & Kelly, E. F. (2007). Unusual experiences near death and related phenomena. In E. F. Kelly, E. W. Kelly, A. Crabtree, A. Gauld, M. Grosso, & B. Greyson (Eds.), *Irreducible mind: Toward a psychology for the 21st century* (pp. 367–421). Rowman & Littlefield Lanham. https://doi.org/10.5771/9781442202078-367

Lambert, N., Chen, Y.-N., Cheng, Y.-C., Li, C.-M., Chen, G.-Y., & Nori, F. (2013). Quantum biology. *Nature Physics, 9*, 10–18. https://doi.org/10.1038/nphys2474

Lane, N. (2015). *The vital question: Energy, evolution, and the origins of complex life*. W. W. Norton & Company.

Maturana, H. R., & Varela, F. J. (1980). *Autopoiesis and cognition: The realization of the living*. Reidel.

Maynard Smith, J., & Szathmáry, E. (1995). *The major transitions in evolution*. Oxford University Press.

Mediano, P. A. M., Rosas, F. E., Bor, D., Seth, A. K., & Barrett, A. B. (2022). The strength of weak integrated

information theory. *Trends in Cognitive Sciences*, *26*, 646–655. https://doi.org/10.1016/j.tics.2022.04.008

Parnia, S., Keshavarz Shirazi, T., Patel, J., Tran, L., Sinha, N., O'Neill, C., Roellke, E., Mengotto, A., Findlay, S., McBrine, M., Spiegel, R., Tarpey, T., Huppert, E., Jaffe, I., Gonzales, A. M., Xu, J., Koopman, E., Perkins, G. D., Vuylsteke, A., Pradhan, P., Deakin, C. D. (2023). AWAreness during REsuscitation -II: A multi-center study of consciousness and awareness in cardiac arrest. *Resuscitation*, *191*, Article 109903. https://doi.org/10.1016/j.resuscitation.2023.109903

Parnia, S., Post, S. G., Lee, M. T., Lyubomirsky, S., Aufderheide, T. P., Deakin, C. D., Greyson, B., Long, J., Gonzales, A. M., Huppert, E. L., Dickinson, A., Mayer, S., Locicero, B., Levin, J., Bossis, A., Worthington, E., Fenwick, P., & Keshavarz Shirazi, T. (2022). Guidelines and standards for the study of death and recalled experiences of death--A multidisciplinary consensus statement and proposed future directions. *Annals of the New York Academy of Sciences*, *1511*, 5–21. https://doi.org/10.1111/nyas.14740

Schrödinger, E. (1992). *What is life? With mind and matter and autobiographic sketches*. Cambridge University Press. https://doi.org/10.1017/CBO9781139644129

Seth, A. K., & Bayne, T. (2022). Theories of consciousness. *Nature Reviews. Neuroscience*, *23*, 439–452. https://doi.org/10.1038/s41583-022-00587-4

Spira, R. (2017). *The nature of consciousness: Essays on the unity of mind and matter* (1st ed.). Sahaja Publications.

Szostak, J. W. (2012). Attempts to define life do not help to understand the origin of life. *Journal of Biomolecular Structure and Dynamics*, *29*, 599–600. https://doi.org/10.1080/073911012010524998

Thompson, E. (2007). *Mind in life: Biology, phenomenology, and the sciences of mind*. Belknap Press.

Tononi, G. (2008). Consciousness as integrated information: A provisional manifesto. *Biological Bulletin*, *215*, 216–242. https://doi.org/10.2307/25470707

Wahbeh, H., Radin, D., Cannard, C., & Delorme, A. (2022). What if consciousness is not an emergent property of the brain? Observational and empirical challenges to materialistic models. *Frontiers in Psychology*, *13*, Article 955594. https://doi.org/10.3389/fpsyg.2022.955594

Walker, S. I. (2017). Origins of life: A problem for physics, a key issues review. *Reports on Progress in Physics*, *80*, Article 092601. https://doi.org/10.1088/1361-6633/aa7804

Weiler, M., & Acunzo, D. J. (2024). What out-of-body experiences may tell us about the mind beyond the brain. *International Review of Psychiatry, 37*, 120–129. https://doi.org/10.1080/09540261.2024.2436598

Journal of Scientific Exploration
Anomalistics and Frontier Science

RESEARCH ARTICLE

Psi Effects as a Result of Implicit Expectations About Probabilities – Investigating Micro-PK with a Biased Baseline

Moritz C. Dechamps
Ludwig-Maximilians-Universität
moritz.dechamps@psy.lmu.de

Concettina G. N. Iovine
Ludwig-Maximilians-Universität

Markus A. Maier
Ludwig-Maximilians-Universität

SUBMITTED October 24, 2024
ACCEPTED December 21, 2024
PUBLISHED October 15, 2025

https://doi.org/10.31275/20253571

PLATINUM OPEN ACCESS

HIGHLIGHTS

This pilot study explores micro-psychokinesis (micro-PK), defined as mental influences on random systems without physical interaction. Using a coin toss game, we tested whether implicit expectations, like anticipating a 50% win rate, impact micro-PK effects. Results suggest that aligning outcomes with participants' expectations may prevent a decline in these effects. Our findings emphasize the importance of psychological factors such as collectively shared expectations in psi research, though further replication is necessary.

ABSTRACT

This pilot study investigated micro-psychokinesis (micro-PK) effects using a masked coin toss game with biased base-rate probabilities. It was assumed that participants' expectation of fair coin tosses would exhibit a micro-PK effect with empirical mean scores deviating from the base-rates towards a 50% winning probability. Participants were assigned to either a 'lucky' condition with a pre-set 60% baseline win probability or an 'unlucky' condition with a pre-set 40% baseline win probability. In both conditions, a micro-PK biasing effect towards 50% was expected. Individuals' game outcomes were determined by a quantum random number generator (qRNG). Bayesian analysis revealed strong micro-PK effects towards 50% in the 'lucky' group but no effects in the 'unlucky' group. The results obtained in the 'lucky' group indicate that aligning outcomes with participants' probabilistic expectations may support micro-PK performance and potentially prevent decline effects. In contrast to our hypothesis, in the 'unlucky' group, null findings were obtained. Post hoc analyses suggest emotional detachment as a potential moderator of the findings. Further replication is necessary to validate these findings.

KEYWORDS

Micro-PK, Psi, Decline Effects, Replicability, Expectancy Effects.

INTRODUCTION

Micro-psychokinesis (micro-PK) refers to the hypothesized ability to mentally influence random physical systems at the quantum or microscopic level without physical interaction. Unlike macro-PK, which affects larger objects, micro-PK is typically tested using random number generators (RNGs) in controlled settings, where any deviation from randomness is considered evidence of an anomalous effect (Varvoglis & Bancel, 2015). Over the past few decades, meta-analyses of micro-PK experiments have generally shown a small but statistically significant effect,

suggesting that micro-PK may indeed represent a genuine phenomenon (Bösch et al., 2006; Radin & Nelson, 1989). Despite these findings, micro-PK research faces challenges, including replication difficulties and the so-called decline effect, where psi phenomena weaken over time (von Lucadou et al., 2007). This pilot study aimed to address these issues by testing whether aligning experimental outcomes with participants' probabilistic expectations can produce stable micro-PK effects, mitigate the decline effect, and provide insight into psychological factors influencing micro-PK effects.

Radin and Nelson (1989) analyzed results from 515 studies examining influences on RNGs and found a modest but consistent deviation from chance. Similarly, Bösch et al. (2006) reviewed 380 RNG studies and found a significant but small effect size. The authors noted extreme heterogeneity, raising concerns about publication bias—a claim later criticized by Kugel (2011). These findings of a small but significant effect have sparked ongoing interest and debate, leading researchers to explore new methodologies and refine experimental designs (see Varvoglis & Bancel, 2015). *Open Science* methods such as preregistration, open data and reproducible analyses have proven to be useful tools in rendering results more credible, e.g., by providing an exhaustive meta-analysis of all micro-PK studies conducted at a specific lab, thus countering claims of publication bias (Dechamps, 2025).

However, a central issue in micro-PK research is the difficulty in replicating initially successful experiments (e.g., Dechamps & Maier, 2019; Dechamps et al., 2021; Maier et al., 2018; Walach et al., 2021). This has sparked discussions on differentiating natural replication failures following false-positive results from volatile psi effects and the presence of a systematic decline effect – a progressive weakening of observed psi phenomena over repeated trials or replication attempts, which are commonly observed in parapsychology (Colborn, 2018; Dechamps et al., 2021). One explanation for such a systematic decline considers the cascade of observers of a micro-PK experimental result. Since an increase of observers (participants, experimenters, authors, paper readers, etc.) goes hand in hand with increasingly varying and conflicting expectations and intentions, observer-dependent influences on random outcomes could no longer be directed but resemble a chaotic decoherence and eventually an approximation to randomness (Bierman, 2001; Walker, 1975). Von Lucadou et al. (2007) propose a Generalized Quantum Theory that postulates micro-PK to arise from non-local entanglement correlations between mental and physical systems. Information is limited in these systems and must be divided into its novel and confirming aspects. The GQT argues that over time, as data accumulate, spontaneous autonomous effects decrease due to the increased likelihood of convincing confirmatory results (Maier et al., 2022).

This theory posits mind and matter as complementary aspects that relate to subjective and objective reality respectively, thereby creating inherent limitations in demonstrating mental influences with objective measurements (Maier et al., 2024). The debate on decline effects remains active and is not limited to parapsychology, possibly suggesting a more general issue with experiments involving biological systems (Radin, 2006).

A psychological explanation for a decline effect as a result of multiple observers or increasing objectification quality was formulated by Eisenbud (1992). He postulated the existence of a defense mechanism—a subconscious resistance to psi shared among most humans, arising from a subconscious desire to preserve order in nature and ensure reality follows familiar rules. Eisenbud speculated that certain natural laws, particularly probabilistic laws, are governed by unconscious expectations and presuppositions. Consequently, increasingly improbable experimental results, as indicated by robust objectification, may trigger a subconscious desire to maintain familiar natural laws, overshadowing individual psi-inducing motives. Similarly, expanding the observer group could lead to the cancellation of individual motives, favoring archetypal psi tendencies grounded in shared experiences of natural laws.

Following this argument, subconscious or implicit expectations, beliefs, and prior experiences—particularly in probabilistic contexts—should be considered when designing micro-PK experiments. Similar ideas are reflected in models like Stanford's PMIR (Stanford, 1990) and the emotional transgression model (Jakob et al., 2020).

The Present Research

This pilot study investigated the role of preexisting assumptions, expectations, and probabilistic experiences on a micro-PK task. To counteract potential subconscious resistance to psi, we masked the micro-PK effect by presenting outcomes that align with common experiences and expectations of probability. Specifically, we utilized the widely recognized randomness of coin tosses. For most participants, prior experience and implicit expectations align with a 50%-win probability. Unknown by our participants,

we implemented biased coins with either a 60% ('lucky' condition; LC) or 40%-win probability ('unlucky' condition; UC) and hypothesized that psychological factors typically responsible for the decline effect would, in this context, support an actual randomness biasing micro-PK effect i.e., a tendency towards 50% probability in both conditions.

Specifically, we predicted that individuals in the UC (40% win probability) would exhibit more than 40% hits on average, and in the LC (60% win probability) would exhibit fewer than 60% hits on average, to confirm their deeply rooted 50% probability expectation. This setup aimed to counteract opposing forces to micro-PK influence due to unease associated with experiences that do not match pre-existing probabilistic notions.

METHODS

Ethical Guidelines

Participants were informed about the voluntary nature of the study and data protection measures at the beginning of the online experiment. Informed consent was obtained via a button press. Data collection and analysis were conducted anonymously. The study was approved by the ethics committee of LMU Munich's Faculty of Psychology and Education.

Participants

A total of 1,602 participants took part in the study, with 21 excluded for requesting their data not be included and 18 excluded for being underage. Another 38 participants who did not answer the data integrity question were also excluded, resulting in a final sample of 1,526 participants (1,012 female, 491 male, 23 diverse). The data exclusion criteria were consensually stated before data collection and performed before data analyses. The mean age was 32.47 years (SD = 13.94), with most participants being students (40%) or employed (38%). The study was conducted online in German (89%) and English (11%). Incentives for participation included course credit for psychology students (11.4%), while other participants were not compensated.

MATERIALS

Coin Toss Game

Participants played a 20-round coin toss game, guessing the outcome of each coin flip. A quantum random number generator (qRNG) connected to the experiment's server determined the outcomes. The probabilities were biased for two conditions: a 'lucky' group with a 60%-win probability (LC) and an 'unlucky' group with a 40%-win probability (UC). The qRNG generated a number between 1 and 100 for each toss. In the LC, a result of 60 or below signified a win, while a result of 40 or below indicated a win for the UC. Participants were unaware of this process.

Measures

Belief in Luck and Luckiness

Participants' belief in luck and personal luckiness were measured using the 16-item Belief in Luck and Luckiness Scale (BLLS; Thompson & Prendergast, 2013). The scale consists of two subscales: Belief in Luck and Personal Luckiness, each rated on a 5-point Likert scale (0 = Strongly disagree to 4 = Strongly agree) with higher scores indicating stronger beliefs. The scale showed high reliability (α = .82 for Belief in Luck, α = .85 for Luckiness).

Belief in a Just World

The General Belief in a Just World Scale (GBJW; Dalbert et al., 1987) was used to assess participants' belief in the fairness of the world. The six-item scale was rated on a 6-point Likert scale (0 = Strongly disagree to 5 = Strongly agree). Higher scores indicated stronger beliefs in justice (α = .78)

Additional Questions

Three further questions were asked on a 5-point Likert scale, assessing participants' motivation to win, belief in unchangeable natural laws, and perceived ability to influence reality.

Procedure

Participants were recruited online through social media, university platforms, and personal networks and received a link to the online study. They were randomly assigned to either the 'lucky' or 'unlucky' condition and completed a questionnaire on their beliefs in luck. They then participated in a 20-round coin toss game. Each round, they were asked to guess 'heads' or 'tails' while viewing the corresponding sides of a made-up coin (see Figure 1). After registering their choice via button-press, a qRNG provided a number (1–100) to determine a win or loss. A 4000ms animation displayed a spinning coin, ending with

Figure 1. An Imaginary Coin was Created by an AI and Used as a Stimulus.

the chosen side (win) or the opposite side (loss), accompanied by feedback: "Well done!" or "Unfortunately, wrong guess." Participants' cumulative wins and losses were displayed throughout. After the game, participants reported their belief in a just world, responded to additional questions, and provided demographic information.

Design and Statistical Analysis

The study employed a single-group design with two conditions: a 'lucky' condition (LC; 60% win probability) and an 'unlucky' condition (UC; 40% win probability). The dependent variable (DV) was the number of successful hits in the coin toss game.

Data were analyzed using Bayesian statistics, with a small prior effect size estimate following an uninformed Cauchy distribution $\delta \sim$ Cauchy (0, 0.1), which was defined a priori before data collection. Hypotheses were tested using one-sample Bayesian t-tests, predicting fewer wins in the LC and more wins in the UC than would be expected by chance. A Bayes factor threshold of 10 (strong evidence for H1 or H0) was used for hypothesis evaluation. Data analysis was performed in R (version 4.4.1), with materials and data available at OSF (https://osf.io/2zgp5).

RESULTS

Main Analysis

To test for a micro-PK effect in the LC, a one-tailed Bayesian t-test was conducted to assess whether participants averaged fewer than 12 hits. The result showed strong evidence for H1 (BF_{10} = 10.87, Cohen's d = .09), with participants averaging fewer hits than expected by chance in the LC (N = 801, M = 11.80, SD = 2.13). Figure 2 (red line) displays the change in BF across data accumulation. A robustness analysis of the prior revealed moderate robustness, with strong support for H1 with medium prior widths and anecdotal evidence with larger priors.

In the UC (N = 725), the one-tailed Bayesian t-test testing for more than 8 hits on average found moderate evidence for H0 (BF_{01} = 3.76), with participants' performance aligning with chance (M = 8.00, SD = 2.18). Figure 2 (blue line) shows the BF progression.

Exploratory Analyses

There were no significant differences between the 'lucky' and 'unlucky' subsamples regarding belief in luck, personal luckiness, or belief in a just world. However, participants in the LC rated winning as more important (M = 2.65, SD = 1.25) than those in the UC (M = 2.41, SD = 1.21), $t(1512) = 3.86$, $p < .001$. Additionally, a marginally significant difference emerged regarding participants' perceived ability to influence reality, with a higher sense of influence reported in the LC (M = 4.04, SD = 1.03) compared to the UC (M = 3.94, SD = 1.09), $t(1514) = 1.75$, $p = .08$. No differences were found for belief in unchangeable natural laws.

No significant relationships were found between the DV and other measures within each condition, except for the low-probability group (UC), where motivation to win showed a modest but significant correlation with the DV: $r(718) = .12$, $p < .001$.

Gender effects were not significant, but females showed a slightly stronger effect than males in both the LC (M_{female} = 11.76, M_{male} = 11.88) and the UC (M_{female} = 8.04, M_{male} = 7.92). No notable differences emerged based on age, occupation, education, language, or whether participants received compensation or not.

DISCUSSION

This pilot study aimed to investigate micro-PK effects by minimizing potential decline effects caused by participants' implicit beliefs or experiences. Specifically, participants' expectations of fair coin tosses and thus their preference for a 50% win probability and its effect on micro-PK was investigated (see Eisenbud, 1992). By employing a biased coin toss game, we tested two independent groups: a 'lucky' group with a 60% win probability and an 'unlucky' group with 40% win probability. We hypothesized that participants' expectations would adjust outcomes towards a perceived 50% win rate. Bayesian analysis showed strong evidence for such an influence in the high-probability LC, while no effect was observed in the low-probability UC.

Figure 2. Sequential BF Curves for the 'Lucky' (Red) and 'Unlucky' (Blue) Subsamples.

The promising results in the LC suggest that the decline effect could be avoided by aligning outcomes with participants' expectations. If replicated, this supports the idea that psychological factors, such as prior experience or implicit beliefs, contribute to the decline (Eisenbud, 1992). However, the assumption of a shared implicit expectation among participants would be required to account for effects on a broader, experimental level. Failure to replicate would lean towards alternative explanations, such as pragmatic information in entangled psycho-physical systems (von Lucadou et al., 2007) or the influence of multiple observers with varying expectations (Bierman, 2001; Walker, 1975).

In contrast, the hypothesized micro-PK effect did not emerge in the UC, possibly due to a reduced motivation to win, as shown by a correlation between hits and post-game motivation. Given that motivation was assessed after the game, it's likely that participants who experienced more losses became emotionally detached, protecting themselves from frustration. This emotional disengagement could explain the lack of effect, particularly among male participants, who tend to be more competitive (Niederle & Vesterlund, 2007). The smaller sample size in the 'unlucky' group (n_{lucky} = 801, $n_{unlucky}$ = 725), potentially due to higher dropout rates, further supports the notion of frustration-driven disengagement.

Several limitations must be considered. The study's external validity may be somewhat limited, as the sample was not fully representative of the general population in terms of age and gender distribution. However, by collecting data online, we accessed a community sample rather than relying solely on a homogeneous student sample, which is common in psychological research. Many participants questioned the game's fairness, which may have impacted their engagement. Future studies could mitigate this by incorporating a cover story or subtler biases. Additionally, the display of performance may have framed the game too competitively, leaving less room for subjective experiences to shape outcomes. Emotional investment and its frustration, especially in the 'UC' group, may have hindered the emergence of micro-PK effects. Future studies could explore probabilistic scenarios without an active emotional involvement to better isolate the intended effects.

Finally, replication of the findings in the 'lucky' group is essential for understanding the mechanisms underlying the replicability and decline of psi effects. A direct replication of the findings of the LC subsample is already in planning. Investigating emotional detachment and its influence on micro-PK effects could offer further valuable insights into how attitudes influence outcomes.

IMPLICATIONS AND APPLICATIONS

The study's findings suggest that a decline of micro-PK effects might be circumvented by aligning experimental outcomes with participants' implicit expectations. This approach may be applicable to other psi effects, like anomalous cognition, but also beyond parapsychology, for example, in behavioral research or studies involving observer

effects. The integration of psychological and probabilistic factors could also inform interdisciplinary approaches in fields like quantum mechanics and consciousness studies, where the interaction between mind and matter is debated. Future research could explore similar designs in other psi domains or phenomena linked to probabilistic expectations.

AUTHOR CONTRIBUTIONS

Moritz C. Dechamps: Conceptualization, Methodology, Software, Formal Analysis, Data Curation, Writing – Original Draft.

Concettina G. N. Iovine: Methodology, Investigation, Formal Analysis, Writing – Review & Editing.

Markus A. Maier: Supervision, Project Administration, Writing – Review & Editing.

DATA AVAILABILITY

The primary data collected for this study, analyses scripts, and materials are available at OSF Repository: https://osf.io/2zgp5.

Researchers can access the raw data for independent verification or analysis. Further inquiries should be directed to the corresponding author.

REFERENCES

Bierman, D. J. (2001). On the nature of anomalous phenomena: Another reality between the world of subjective consciousness and the objective world of physics. In P. van Loocke (Ed.), *The physical nature of consciousness* (pp. 269–292). John Benjamins. https://doi.org/10.1075/aicr.29.12bie

Bösch, H., Steinkamp, F., & Boller, E. (2006). Examining psychokinesis: The interaction of human intention with random number generators—A meta-analysis. *Psychological Bulletin, 132*(4), 497–523. https://doi.org/10.1037/0033-2909.132.4.497

Colborn, M. (2018). Decline effect in parapsychology. *The Society for Psychical Research*. https://psi-encyclopedia.spr.ac.uk/articles/decline-effect-parapsychology

Dalbert, C., Montada, L., & Schmitt, M. (1987). Glaube an eine gerechte Welt als Motiv: Validierungskorrelate zweier Skalen. *Psychologische Beiträge, 29*(4), 596–615.

Dechamps, M. C. (2025). Meta-analysis of a complete micro-PK database from the LMU Lab: Years 2016–2025. https://mrzdcmps.github.io/labreport

Dechamps, M. C., & Maier, M. A. (2019). How smokers change their world and how the world responds: Testing the oscillatory nature of micro-psychokinetic observer effects on addiction-related stimuli. *Journal of Scientific Exploration, 33*(3), 406–434. https://doi.org/10.31275/2019/1513

Dechamps, M. C., Maier, M. A., Pflitsch, M., & Duggan, M. (2021). Observer-dependent biases of quantum randomness. *Journal of Anomalous Experience and Cognition, 1*(1–2), 114–155. https://doi.org/10.31156/jaex.23205

Eisenbud, J. (1992). *Parapsychology and the unconscious* (Rev. ed.). North Atlantic Books.

Jakob, M.-J., Dechamps, M. C., & Maier, M. A. (2020). You attract what you are: The effect of unconscious needs on micro-psychokinesis. *Journal of Parapsychology, 84*(2), 227–253. https://doi.org/10.30891/jopar.2020.02.06

Kugel, W. (2011). A faulty PK meta-analysis. *Journal of Scientific Exploration, 25*(1), 47–62.

Maier, M. A., Dechamps, M. C., & Pflitsch, M. (2018). Intentional observer effects on quantum randomness: A Bayesian analysis reveals evidence against micro-psychokinesis. *Frontiers in Psychology, 9*, 379. https://doi.org/10.3389/fpsyg.2018.00379

Maier, M. A., Dechamps, M. C., & Rabeyron, T. (2022). Quantum measurement as pragmatic information transfer: Observer effects on (s)objective reality formation. *Journal of Anomalous Experience and Cognition, 2*(1), 16–48. https://doi.org/10.31156/jaex.23535

Maier, M. A., Geissler, C., DeMattia, E. C., Vogel, A., & Dechamps, M. C. (2024). Complementarity of subjective and objective realities: An experimental investigation of variations of subjective self-reported intelligence data when objective data are erased or not erased. *Journal of Anomalistics / Zeitschrift für Anomalistik, 24*(1), 15–54. https://doi.org/10.23793/zfa.2024.015

Niederle, M., & Vesterlund, L. (2007). Do women shy away from competition? Do men compete too much? *The Quarterly Journal of Economics, 122*(3), 1067–1101. https://doi.org/10.1162/qjec.122.3.1067

Radin, D. (2006). *Entangled minds: Extraordinary experiences in a quantum reality*. Gallery Books.

Radin, D. I., & Nelson, R. D. (1989). Evidence for consciousness-related anomalies in random physical systems. *Foundations of Physics, 19*(12), 1499–1514. https://doi.org/10.1007/BF00732509

Stanford, R. G. (1990). An experimentally testable model for spontaneous psi events: A review of related evidence and concepts from parapsychology and other sciences. In S. Krippner (Ed.), *Advances in parapsychological research* (Vol. 6, pp. 54–167). McFarland.

Thompson, E. R., & Prendergast, G. P. (2013). Belief in luck and luckiness: Conceptual clarification and new measure

validation. *Personality and Individual Differences, 54*(4), 501–506. https://doi.org/10.1016/j.paid.2012.10.027

Varvoglis, M., & Bancel, P. A. (2015). Micro-psychokinesis. In E. Cardeña, J. Palmer, & D. Marcusson-Clavertz (Eds.), *Parapsychology: A handbook for the 21st century* (pp. 266–281). McFarland.

von Lucadou, W., Römer, H., & Walach, H. (2007). Synchronistic phenomena as entanglement correlations in generalized quantum theory. *Journal of Consciousness Studies, 14*(4), 50–74.

Walach, H., Kirmse, K. A., Sedlmeier, P., Vogt, H., Hinterberger, T., & von Lucadou, W. (2021). Nailing jelly: The replication problem seems to be unsurmountable—Two failed replications of the matrix experiment. *Journal of Scientific Exploration, 35*(4), 788–828. https://doi.org/10.31275/20212031

Walker, E. H. (1975). Foundations of paraphysical and parapsychological phenomena. In L. Oteri (Ed.), *Quantum physics and parapsychology* (pp. 1–44). Parapsychology Foundation.

Journal of Scientific Exploration
Anomalistics and Frontier Science

RESEARCH ARTICLE

Preliminary study of non-touch hand healing on human skin explants

John Sadi[1]
john.sadi68@gmail.com
orcid.org/0000-0003-3480-6814

Arnault Richard de Chicourt[2]
arnaultdechicourt@gmail.com

[1]Lightnics, 480 avenue des abrivados, 34400 Lunel, France

[2]ARC Formation – 14, avenue de la Cristallerie, 92310 SEVRES, France

SUBMITTED October 15, 2024
ACCEPTED January 8, 2025
PUBLISHED October 15, 2025

https://doi.org/10.31275/20253563

PLATINUM OPEN ACCESS

HIGHLIGHTS

This study investigates whether the healing practice of Non-Contact Hand-Based Energy Healing (NCH) can influence the early stages of wound healing by measuring specific biological markers (inflammation-related and tissue repair indicators) in human scarred skin samples. Based on these indicators, together with a morphological analy-sis, the researchers found signs of inflammation and early wound repair in NCH-treated skin samples, which were absent in untreated samples. These findings suggest that NCH may promote healing. This study supports the need for further research to explore NCH's potential role in integrative medicine.

ABSTRACT

Non-Contact Hand-Based Energy Healing (NCH) is a healing practice with deep roots in various cultures. NCH applied to wound healing still remains a controversial topic due to limited scientific evidence. Nevertheless, it has a strong potential for integrative medicine practices and requires further studies like the present one to provide additional results with more precise measurement techniques. This preliminary work was inspired by the experiments of Grad (Grad et al., 1961, 1963, 1965) and Souza (Souza et al., 2017). The primary goal of this study is to replicate and validate previous findings by applying non-touch NCH on human skin explants. This research investigates the biological effects of NCH on scarred skin explants, with the main objective of determining whether NCH influences early-stage wound healing through specific biomarkers linked to inflammation and tissue repair. Human scar-wounded skin explants were selected as the biological model. Based on preliminary tests, key wound repair markers were chosen for analysis, including erythema-like morphological changes, Ki67 protein expression, and IL6 cytokine concentration. This comparative study involved dividing the skin explants into two groups: a treated group exposed to NCH techniques and a control group with no treatment. The process was performed under standardized conditions to ensure comparability between groups. Both groups underwent three analytical methods: macroscopic morphological inspection via photographs, immunohistochemical analysis for Ki67 and K17 proteins, and ELISA tests for cytokine markers, particularly IL6.

The primary outcome measures included the presence of erythema-like changes (indicating inflammation) in the photographs, the expression of Ki67 protein (a marker of cell proliferation), and IL6 cytokine levels (an inflammatory marker). These indicators were selected for their known relevance to early wound healing and inflammatory

responses. In the treated group, erythema-like changes were observed, along with low levels of Ki67 and elevated levels of IL6. These responses were absent in the control group. The presence of these markers in the treated group suggests an inflammatory response, indicating the early stages of wound repair. This study supports the hypothesis that hand healing induces a biological response in the treated skin explants, characterized by inflammation and early markers of wound healing. These results align with prior studies and provide a basis for further investigation into the efficacy of traditional hand healing practices.

KEYWORDS

laying-on-of-hands, hand healing, therapeutic touch, biofield, skin explant, Ki67, IL6, cytokine, wound repair, wound healing, inflammation, scar, immunohistochemistry, ELISA.

INTRODUCTION

Non-Contact Hand-Based Energy Healing (NCH) is part of complementary and alternative medicine (Benor, 2001). It is sometimes called "healing touch" or "therapeutic touch" (Krieger et al, 1979; Benor, 2001, p. 43), but actual touching of the physical body is not necessary for NCH. Indeed, throughout the present study, NCH was performed without any direct contact with a patient's skin.

There are two main ways to study NCH: 1) to design and conduct an experimental evaluation of a measurable effect; 2) to develop a theory based on initial, generally accepted principles and to derive the observed effects from these principles.

The latter approach is speculative and could easily be dismissed by arguing that it is useless to elaborate a theory on a hypothetical phenomenon. Opponents of the former approach say that we cannot assume the existence of something that we cannot explain with a proper theory. This reasoning contradicts the scientific methodology, which states that we must first observe a phenomenon, then test it under various conditions, and finally elaborate a theory according to these tests' results. As Einstein wrote: "Logical thinking is necessarily deductive; it is based upon hypothetical concepts and axioms.[...]. The most satisfactory situation is evidently to be found in cases where the new fundamental hypotheses are suggested by the world of experience itself." (Einstein, 1936). Examples of such a methodology abound in science, *e.g.*, superconductivity, photosynthesis, and cancer studies. Moreover, the absence of a complete theory does not prevent us from using the observed natural phenomena, as in, *e.g.*, superconductivity and quantum physics in general.

In the present study, we have taken the first path: our experimental study described here aims to assess the existence of an objective effect of NCH on human skin, assuming that hands can have a biological influence on organic tissues.

Either the placebo effect, through conditioning or expectation (Kaptchuk & Miller, 2015), or a psychological effect such as suggestion (Bedford, 2012) are sometimes cited to explain the results obtained. The former placebo effect is emphasized in either human or animal studies. To the authors' knowledge, it is not recognized as effective in plants, as it is a psychological effect. Note here that acknowledging placebo effect in animals implies the existence of consciousness in animals.

Hence, we carefully designed our experimental protocol so that the placebo effect could not be used to explain our results. We made use of skin explants to avoid this effect in this study and based the rest of our design on previous experiments with mice (Grad et al., 1961; Souza et al., 2017).

After describing the historical and scientific context that helped us design the current experiment, we will describe both the biological processes involved here and our experimental protocol. Finally, we will present the results along with our interpretation and conclusions.

HISTORICAL AND SCIENTIFIC BACKGROUND

Historical background

Mentions of hand healing can be found in:

- Ancient Egypt's Ebers papyrus (1600 BCE): "Put your hand on the pain, and say that the pain goes away," and in The Book of the Dead: "I place my hands upon you, Osiris, for your good, to make you live." (Jagot, 1974).
- Ancient Greece by Solon (638 -559 BCE): "But he makes at once healthy the one who is wrecked by some evil and difficult diseases, by touching [him] with both hands" (Tipei, 2001, p. 87).
- Greece by Pline (23-79 CE): "Crates of Pergamus relates, that there formerly existed in the vicinity of Parium, in the Hellespont, a race of men whom he calls Ophiogenes, and that by their touch they were able to cure those who had been stung by serpents, extracting the poison by the mere

imposition of the hand." (Pline the Elder, Vol. VII, II.16).
- Hippocrates: "the force which flows from many people's hands. We can found comparable accounts by Roman authors like Celsius and Plautus." (Rubik et al., 2015).
- Assyrian/Babylonian tablets: "When I approach the sick person, when I enter his house, when I lay my hand on his head..." (Tipei, 2001, p. 92)

The distant action of the hands was associated by analogy with another distant action known at that time: the one of Magnesia stone from Greece, referred to by Thales of Miletus, Anaxagoras, and Aristotle (Thouret, 1784).

The medieval Europe rediscovered Greek knowledge concerning magnets through Arabic invasions, notably with Avicenna, Aetius of Amida, and Alexander Trallianus (Thouret, 1784). Certain authors, like Paracelsius, as well as Digby, attribute the distant action of the hands to a vital or universal fluid/spirit, while some others establish a link with stone magnetism: Cabée, Kircher (1641), Glocenius, Van Helmont, Fludd, and William Maxwell (Thouret, 1784). Kircher believed that "all phenomena are linked together by a magnetic chaining".[1] (Thouret, 1784). Other scientists have the intuition of a correspondence between electricity and the nervous system, *e.g.*, Newton (Newton, 1846, p. 507) relates the motion of the body's members to electricity. They were followed by Le Noble, Laennec, and Maggiorani (Jagot, 1974). Mesmer made his own synthesis from these predecessors, calling the hand healing process "animal magnetism" (Mesmer, 1779). He gave an account of animal magnetism in which he underlines "the analogy of its properties with those of the magnet and electricity". He also describes these properties, noting that it: "penetrated everything; that it could be accumulated and concentrated, like the electric fluid; that it acted in the distance [...]".

In 1784, Mesmer was put under scrutiny by two different medical commissions that could not reach a common conclusion. But Lavoisier commission could have been charged with scientific wrongdoing by replacing the initially agreed "curing ability" criterion with the "fluid detection ability" (Belhoste, 2021; Conickx, 2023). Doing so, the curing tests on patients were replaced by tests of the healers' ability to detect "magnetized" water in glasses and magnetized trees vs non-magnetized ones. While the conclusion of Lavoisier commission was negative, Mesmer also contributed to the science of his time by drawing attention to "somnambulism" and suggestion, now called "hypnosis". Doing so, he paved the way for future investigators like Charcot (Charcot, 1892) and Freud (Freud, 1891).

Even before that time, but especially during the 17th and 18th centuries, there were remarkable interactions, confusions, and influences between the fields of hand healing, hypnosis, electricity, and magnetism. The aforementioned quote by Mesmer testifies that these domains were seen as related. The then recent discovery of electrical influences on biological organisms by Galvani (Guédron, 2009) could have influenced Mesmer for merging the older concept of a vital fluid with the new one of electricity. The subsequent exploration of this field later gave birth to electrophysiology by du Bois-Reymond in 1842 (Finkelstein, 2015) and electrotherapy (Bonnefoy, 1882). Furthermore, the need to understand the behavior of people reacting to "magnetic" treatments from Mesmer and colleagues led to the scientific study of nervous diseases (Charcot, 1892) and then to psychoanalysis (Lakhdari, 2007). Indeed, Freud and Jung recognized hypnosis as a useful tool for psychology (Freud, 1891; Hartmann & Zimberoff, 2013). On the physics side, J.C. Maxwell explained how electricity and magnetism are deeply related. As knowledge progressed, these fields specialized and took separate paths. In spite of this separation, some connections seem to exist, *e.g.*, physical healing can be attributed to psychological suggestion (Bedford, 2012). Hence, the need to properly address the placebo effect in such studies.

Scientific background

The first half of the 20th century was troubled by two wars and the advent of chemical medicines, which held back research in the NCH field. As of 2015, there have been "over 30 published clinical trials reporting effects of biofield therapies for pain in ambulatory and hospitalized patient populations with chronic pain, arthritis, and movement restriction." (Jain et al., 2015). One of these pioneering works was held in the 1960s by Bernard Grad, who applied modern scientific methodology to this field by performing experiments on mice and plants (Grad et al., 1961, 1963, 1965) in Canada.

The Grad experiment (Grad et al., 1961) with wounded mice needs to be detailed here as it was one of the main sources of inspiration for our own experiment described hereafter. Grad cut out a part of the skin from 300 mice put to sleep, the area of each wound was then precisely measured at four different moments in time: the day of the wounding (day 0), then on day 1, day 11, and day 14. Before each trial, ten mice were placed in individual boxes within

cages and trained to remain calm. The mice were divided into three groups: two control groups and one treatment group. One of the control groups received heat to simulate the temperature increase caused by hands during treatment. The treatment group received hand healing sessions from healer Oscar Estebany twice daily for 15 minutes each, five times a week. On day 11 and day 14, the wounds of the treatment group were significantly smaller compared to both control groups. The wound areas of the two control groups were not significantly different from each other.

Grad then came up with the idea to conduct an experiment using "wounded" plant seeds (Grad et al., 1963, 1965). The procedure involved watering barley seeds with a salt solution on day 1 (wounding step), followed by drying them in an oven at 38-40°C, and then watering them again with regular water. The plant pots, each containing 20 seeds, were not directly hand-treated, but NCH was applied to the watering solution poured over the seeds. Two parameters were measured: the number of seedlings emerging from the soil and the heights of the plants. Statistical analysis revealed that the treated group performed better than the control group in terms of both criteria. This experiment was repeated in a double-blind manner, yielding the same statistically significant results.

Grad and others (Barry, 1968) inspired Dolores Krieger, a nurse, and Dora Kunz, a natural healer, to develop their own therapeutic method (Krieger, 1979). The NCH was renamed "Therapeutic Touch" (TT) by Krieger, which is confusing, as it implies a physical contact between hand and body, while there is not. She emphasized the fact that anybody can heal with their hands, having the proper mindset.

It should be noted that the need for a specific mindset has not been established as a mandatory requirement, either through the daily NCH practice or the training of other practitioners by one of the authors. We rather suspect an underlying mechanism of a physical nature, *e.g.*, an electromagnetic interaction.

The Grad experiment was replicated in 1984 in the Villejuif hospital near Paris with healthy seeds (no salt solution used to "wound" the seeds) by Yves Lignon (statistician), Léon Schwartzenberg (experimenter), and Jean-Marie Le Gall (hand healer) (Lignon, 1989; Raoul, 2021; Lignon & Danier, 1984). The originality of this experiment is that it was done under the scrutiny of a legal officer (Maître Djian) to ensure no trickery could be performed. Sixteen plant pots were used for the results to be statistically significant, eight being watered with treated water and eight with ordinary water. Pouring water volume was precisely measured. The NCH treatment duration was 10 minutes per bottle of water. The plant height measurement occurred two weeks after the start of the experiment. Both peas and radish seeds were used. Another identical, two-week experiment was performed after the first one. The results of the second experiment show statistically significant higher heights in the case of radish plants ($p < 0.001$). The experiments by Grad and Lignon both suggest that there is a statistically significant effect of the NCH on plants.

Souza et al. (Souza et al., 2017) performed an assessment of NCH on 24 wounded rats. Fibroblast count and measure of wound size were performed on day 1, 4, and 7 after the wounding. On the 7th day, fibroblast counts were significantly higher in the treated group than in the control group. The wound shrinkage was also more pronounced in this group. These data support the Grad hypothesis made with mice (Grad et al., 1961, 1965), that NCH may accelerate wound repair, presumably by increasing fibroblast activity, among other potential processes.

Our study design was inspired by these past works: we chose to focus on NCH effect on human skin explant in order to limit any type of psychological influence (placebo effect) on the outcome of the experiment.

Biological processes involved in wound repair

Wound repair mechanism

Wound or tissue repair occurs after a cutaneous injury has occurred, which also induces bleeding. It is usually described as a process involving four main stages (Laurent et al., 2017): hemostasis, inflammation, proliferation, and dermal remodeling (Wilkinson & Hardman, 2020). It should be noted that these stages have no clear-cut separations between them: they overlap as tissue repair is a continuous process, well-orchestrated and synchronized, involving many actors present through the above-mentioned stages.

The hemostasis stage. This stage is aimed at forming a clot, which prevents both blood from leaking and bacterial entry by re-establishing the barrier function of the skin. The hemostasis stage includes a coagulation step occurring through platelets and mediated by the thrombin enzyme. Platelets are activated by contacting the damaged vascular subendothelial matrix. Platelet receptors, like, *e.g.*, glycoprotein VI, react with extracellular matrix (ECM) proteins, *e.g.*, fibronectin or collagen, to enable

their adherence to the blood vessel wall (Wilkinson & Hardman, 2020).

Moreover, platelets release:

- cytokines attracting leukocytes to the injury site;
- growth factors that stimulate the migration of skin constituents like fibroblasts and keratinocytes. Fibroblasts are cells dedicated to the formation of tropocollagen, the precursor of collagen. Fibroblasts are also involved in the secretion of all the components of the ECM through synthesis of the gel-like ground substance. Fibroblast transform itself into fibrocyte, its stable state. As mesenchymal cells, fibroblasts express a "major type III intermediate filament (IF) protein", namely: vimentin. Vimentin can thus be used as a biomarker for fibroblast, in addition to playing "an important structural and functional role in forming and regulating the cytoskeleton" of the cells (Dave & Bayless, 2014). Keratinocytes, on their side, are the cells forming the normal skin's outermost layer (epidermis).

Thrombin is central to the coagulation process as it is involved in a lot of reactions occurring during this step. The primary thrombin reaction takes place with fibrinogen, converting it into fibrin. Indeed, fibrinogen is depleted as the thrombin concentration increases (Dashkevich et al., 2012). According to this latter study, thrombin propagates in the form of an impulse-like wave of constant peak amplitude and spatial velocity. As the thrombin wave propagates, the fibrin clot also extends at a constant spatial velocity. The thrombin excitation wave propagation is made possible by:

- a positive feedback loop leading to an autocatalytic thrombin production;
- a clotting protein: plasma thromboplastin antecedent (factor XI).

Blood can thus be compared to an excitable medium that supports thrombin wave propagation and functions as a "biological nonlinear dynamic system" (Dashkevich et al., 2012), in close analogy with what is known from neural impulse propagation. This phenomenon enables "Rapid and steady spatial signal propagation across significant distances in a heterogeneous system" (Dashkevich et al., 2012). It was also found by the same authors that this thrombin excitation wave stops propagating as soon as it comes into contact with thrombomodulin, which is abundant in healthy endothelium.

The inflammation stage. Inflammation is an immune response against pathogenic wound invasion. It involves mainly two types of leukocytes (neutrophils and monocytes), pro-inflammatory proteins, and macrophages (Laurent et al., 2017). During the inflammation stage, pro-inflammatory proteins such as cytokines and chemokines are released through "a variety of cell types, but the most important sources are macrophages and monocytes at inflammatory sites" (Gabay, 2006). These proteins attract moving leucocytes, notably neutrophils, to the wound to prevent infection. In turn, these neutrophils release additional cytokines. Cell adhesion molecules, such as selectins, are also expressed through pro-inflammatory molecules during the inflammation process. Selectins have been shown to play an important role in immune cell recruitment (Wilkinson & Hardman, 2020). The most notable cytokines released at the cutaneous injury are: tumour necrosis factor (TNF)-α, interferon (IFN)-γ, transforming growth factor (TGF)-β, interleukin (IL) 1, 6, and 8 (Jiang et al., 2012). Lipopolysaccharide (LPS) also plays a role in the inflammation process by triggering the release of cytokines. (Wilkinson & Hardman, 2020; Gabay, 2006). Neutrophils are mostly destroyed by adhering to the fibrin scab. The remaining neutrophils are eliminated by macrophages originating from monocytes that migrate to the wound tissue. Two types of macrophages are involved in the inflammation: the pro-inflammatory phenotype macrophages (PIPM) and anti-inflammatory (AIPM) ones. The PIPM replace neutrophils as the main inflammatory agent, through the phagocytose of the latter. The AIPM results from either a phenotype switch from the PIPM type or from newly coming monocytes (Wilkinson & Hardman, 2020). Moreover, B, T, and mast cells have also been shown to play an anti-inflammatory role during the inflammation process (Nosbaum et al., 2016; Weller, 2006).

At the end of the inflammation stage, foxp3-expressing regulatory T cells (Tregs) accumulate in wound tissue, inducing a decrease in IFN-γ and PIPM production, thus attenuating the inflammation. This step facilitates "wound repair through epidermal growth factor receptor (EGFR) pathway" (Landén et al., 2016).

During the transition from inflammation to proliferation, plasmacytoid dendritic cells (pDCs) produce type I interferons (IFN-α/β) via toll-like receptors (TLR)7- and TLR9-dependent mechanisms, which induce "early inflammatory responses and re-epithelialization of injured skin" (Landén et al., 2016): the wounded epidermal layer starts to reform. Langerhans cells are also concentrating at

the wound site, though their role is not fully understood (Landén et al., 2016).

The proliferation stage. Proliferation encompasses re-epithelialization (granulation tissue formation through keratinocytes), fibroblast migration and proliferation, and synthesis of extracellular matrix (ECM) (Prabhu et al., 2022). These are stimulated by wound–related signals, some being synthesized by macrophages, *e.g.*, nitric oxide.

The proliferative phase also involves γδT cells eliminating damaged keratinocyte, releasing fibroblast growth factor (FGF)-7, keratinocyte growth factor (KGF)-1, and insulin-like growth factor (IGF)-1. This, in turn, stimulates the proliferation of healthy keratinocytes. γδT cells also produce IL-17 and express host-defense molecules in epidermal keratinocytes, promoting wound healing (Landén et al., 2016). Of particular interest in relation to NCH potential mechanism: "keratinocytes are activated by changes in mechanical tension and electrical gradients" (Wilkinson & Hardman, 2020). Keratinocytes upregulate some keratin (K) IF proteins, notably K17. K17 is not normally expressed in the suprabasal layers of the epidermis but are rapidly induced by stressed keratinocytes upon wounding (Werner et al., 2007; Russo et al., 2020). The release of K17 is ongoing through the following remodelling stage, until the barrier function of the skin is restored, "suggesting these keratins play important physiological roles during repair" (Zhang et al., 2019).

Mast cells not only contribute to the proliferation of keratinocytes too, but are also involved in the proliferation of fibroblasts and endothelial cells (Weller et al., 2006).

Plasmin, a protease, enhances keratinocyte migration by eliminating the provisional fibrin-rich wound tissue. Fibroblasts have a key role in replacing the fibrin-rich temporary matrix with a more substantial new connective tissue and microscopic blood vessels (both forming the granulation tissue). Proliferating cell nuclear antigen (PCNA) and Ki67 are common markers of cellular proliferation (Landén et al., 2016): "Ki67 is a nuclear protein associated with the cell cycle, synthesized by all proliferating cells of the active cell cycle and deficient in resting cells" (Prabhu et al., 2022).

Blood vessels form through the angiogenesis mechanism triggered by hypoxia, which also expresses other factors like, *e.g.*, hypoxia-inducible factors (HIFs), cyclooxygenase 2, and vascular endothelial growth factor (VEGF). Macrophages are also known to participate in this process by structuring the newly created vessels (Wilkinson & Hardman, 2020).

The granulation tissue is mainly constituted of fibronectin, immature collagens, and proteoglycans. Fibroblasts are triggered by signalling molecules released through platelets, endothelial cells, and macrophages, along with such growth factors as, *e.g.*, TGF-β and platelet-derived growth factor (PDGF) (Wilkinson & Hardman, 2020).

To rebuild sensory receptors, an innervation step then occurs to regenerate the nerve fibers.

The dermal remodeling stage. The remodeling of the ECM is either seen starting with the initial fibrin clot deposition (Wilkinson & Hardman, 2020) or at the end of the granulation tissue formation (Landén et al., 2016). This phase ends in a matter of years with mature collagen presence in the scar.

Mechanical force and cytokines enable fibroblasts to differentiate into myofibroblasts, which in turn express an actin that contracts the wound. Myofibroblasts then disappear through apoptosis. In parallel, the collagen III produced in the ECM during earlier stages is replaced by collagen I, which is a stronger type, though it takes longer to form. At this stage, fibroblasts replace the remaining fibrin clot with hyaluronan, fibronectin, and proteoglycans. The above-mentioned collagen evolution is promoted by proteoglycans. It requires a fine tuning between collagen degradation and synthesis, through temporal synchronization of metalloproteinases (MMPs), expressed by AIPM, fibroblasts, and keratinocytes. Elastin, formed from tropoelastin, enables the reformation of elastic fibres to retain skin elasticity (Wilkinson & Hardman, 2020).

A decrease in the blood flow and the number of blood vessels is observed (Landén et al., 2016).

The wound healing process ends when macrophages, endothelial cells, and fibroblasts disappear through apoptosis or migrate out of the injury site (Wilkinson & Hardman, 2020).

Wound repair markers elected for this study

The description of the wound healing process given above is synthesized in the overview Table 1, highlighting (bold font) the markers chosen for this study.

According to Table 1, Aquiderm –the contracted biological laboratory- selected the following seven markers of inflammation and proliferation: IL6, IL8, TNF-α, IFN-α, IFN-β, Ki67, and K17 (Rambert, 2019). Their concentration or count was measured to assess the presence of a wound repair mechanism at play in human skin explant samples.

Table 1. Overview table showing the cells involved in the wound healing process at each stage and the cells selected for subsequent analysis in this study (bold font).

Wound repair stage	Cells involved	Markers chosen in our experiment
Hemostasis	Thrombin, Platelet, fibrinogen, fibrin, fibronectin, glycoprotein VI, collagen III, fibroblast, vimentin, plasma thromboplastin antecedent (factor XI).	
Inflammation	Neutrophils, monocytes, cytokines (**IL6**, IL1, **IL8**, **TNF-α**, IFN-γ, TGF-β), chemokines, selectins, LPS, PIPM, AIPM, Tregs.	IL6, IL8, TNF-α
Transition from inflammation to proliferation	**IFN-α, IFN-β.**	IFN-α, IFN-β
Proliferation	Nitric oxide, γδT cells, FGF7, KGF1, IGF1, IL17, **K17**, fibroblasts, plasmin, PCNA, **Ki67**, HIFs, cyclooxygenase2, VEGF, BCL2, TGF-β, PDGF.	Ki67, K17,
Dermal remodeling	Myofibroblasts, actin, collagen I, hyaluronan, fibronectin, proteoglycans, and elastin.	

METHOD

The experiment described here was carried out at Aquiderm (within Inserm U1035 laboratory), Bordeaux, France. It took place from 26 August 2019 until 30 August 2019 (5 days). Below is a summary of their report (Rambert, 2019) with additions by one of the authors (ARC).

Experiment preparation and conditions

Materials

Thirteen tissue explants (NativeSkin® models) were provided by Genoskin company (Toulouse, France) and delivered by the TNT carrier. They originated from a twenty-one-year-old Caucasian woman with no skin pathology. The culture of these explants and the measurement of wound healing through molecular markers were performed by Aquiderm (Rambert, 2019).

Among the thirteen explants, six were dedicated to the hand healing treatment, while the seven left formed the control group. Each skin explant was wounded by a scar in its center (Figure 1).

Culture of skin explants

The NativeSkin® models were placed in a maintenance medium (provided by Genoskin company) in an air/liquid interface, ensuring that the dermis was submerged in the culture medium while the outer layer of the Stratum Corneum was exposed to the air. The culture plates were kept in an incubator at 37°C, 5% CO2, and 95% humidity. The maintenance culture medium was changed daily throughout the study.

Macroscopic Photographs

Every day during the study, the skin explants were observed, and macroscopic photographs were taken to assess morphological changes.

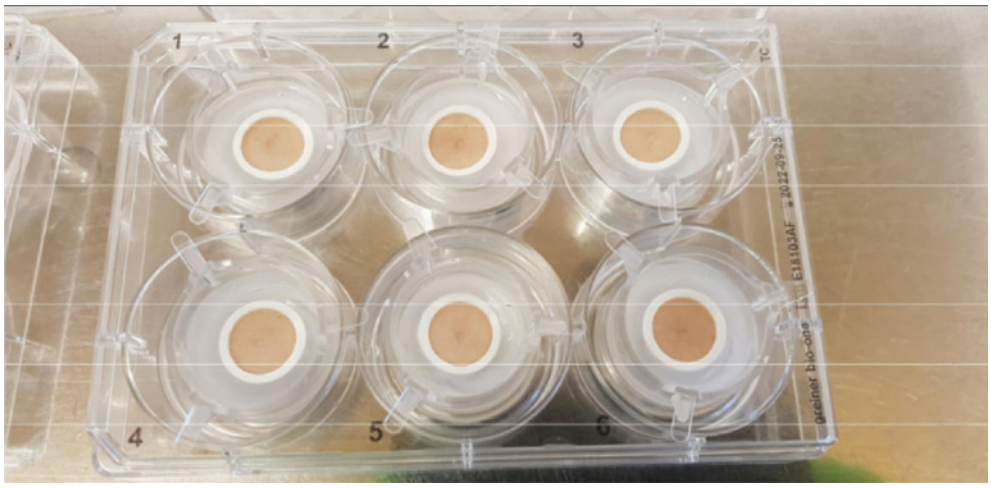


Figure 1. Photograph taken on the fifth day of the experiment. Control group.

Hand Healer Preparation and Method

One of the authors, (ARC), a hand healer, conducted an NCH experiment on scarred skin explants for five consecutive days at the Aquiderm facility (Rambert, 2019). Two sessions of NCH healing, each lasting 1.5 hours, were performed every day: one in the morning and one in the afternoon. In total, each treated sample received 15 hours of NCH healing throughout the entire experiment. The NCH was applied according to the method described in Durville (Durville, 1900).

Mental fatigue had to be accounted for, as the mental attitude required was a mix between relaxed meditation and focused concentration on the hands above the skin explants, to ensure proper positioning over a small surface area (3 cm of radius).

To prepare for this intense work and avoid physical and mental fatigue during the experiment, ARC underwent a two-month training regimen, which included:

- Reviewing previous protocols (*e.g.*, Souza et al., 2017; Grad et al., 1961).
- Acquiring biological knowledge about the stages of wound healing.
- Abstaining from consuming any alcoholic beverages.
- Daily walks and jogging sessions covering a distance of 10 km per day.
- Daily Qi-Gong sessions to promote mental calmness and induce an "alpha wave" (8-10 Hz) state of mind, as well as facilitate the circulation of bodily energy.
- Regular sleep schedule with waking up at 7:30 AM and going to bed at 10:00 PM.

During the sessions at Aquiderm, ARC performed a "magnetic" pass known as palmar imposition (Durville, 1900, p.73; Durville & Jagot, 1914) without making contact with the open 6-well culture plate or the skin inside it. This pass was conducted by orienting the palm side of the hand towards the sample, while maintaining a distance of one to three centimeters.

The right and left hands were alternated over the samples during the NCH healing sessions. Once located over a sample, the hand remained static above it. The palmar imposition technique accounted for 80% of the total NCH healing duration of this experiment.

Palmar imposition was also done by placing both hands, with fingers extended, in a concave "dome" shape over the whole six culture plates containing the skin samples in their maintenance culture medium.

Another technique called finger projection ("projection digitale") or digital imposition (Durville, 1900, p. 74; Durville & Jagot, 1914) was employed, using only the fingertips that pointed towards the skin explants. This technique allows the practitioner to target a specific area of treatment by spreading the fingers apart (for larger areas, *e.g.*, lower back pain) or bringing them together in "bundles" (for smaller areas, *e.g.*, warts), based on the practitioner's assessment.

The third technique used is termed "heteronomic position" (Durville & Jagot, 1914): the object to be treated is placed between the palms of the hands facing each other, thus enveloping the object. This technique is traditionally used for deep organs, such as the intestines or liver, or any other organ located between the anterior and posterior sides of the abdomen. Enveloping or sandwich imposition allows for a more intense and extensive overall action on the anatomical areas.

This technique, through the alleged transverse field it produces, and the associated enhanced effects, seemed appropriate here to compensate for the lack of blood vessels in the skin explants, while the living organisms used in other experiments (Grad et al., 1961; Souza et al., 2017) were all vascularized. In the latter case, the placebo effect could have been invoked to explain the results, contrary to our experiment with unconscious skin explants. Furthermore, this technique, in combination with palmar imposition, replicates the real-life practice of wound care sessions with patients in a hand healer's office.

Finger projection and heteronomic position accounted for approximately 20% of the total NCH healing time in this experiment, with palmar position accounting for the remaining 80% of the time.

Methods of analysis and data exploitation

Sample preparation and preservation for analysis

At the end of the five days of NCH treatment:

- Submergents were collected and frozen at -20°C for subsequent measurement of inflammation mediator cytokines (IL6, IL8, TNF-α, IFN-α, IFN-β).
- Skin explants were also collected and cut into two parts. Half of these parts were frozen at -80°C, and the other half was embedded in paraffin to perform immunohistochemical staining of wound healing markers (Ki67 and K17) on tissue sections.

Methods of analysis used

Measurement of Ki67 and K17 proliferation markers by immunohistochemistry. The skin explants were cut in half at the center of the scar and perpendicular to it. The samples reserved for immunohistochemical analysis were fixed in a 4% paraformaldehyde solution for 24 hours. The explants were then embedded in a paraffin block following standard procedures. Thin sections of 4 µm thickness were cut using a microtome and mounted on glass slides.

After deparaffinization of the sections, antigen retrieval was performed using a pH 9 citrate buffer solution (Dako, Les Ulis, France). The sections were then incubated overnight at 4°C with either the anti-Ki67 antibody (Abcam, Paris, France) or the anti-K17 antibody (Clinisciences, Nanterre, France). For immunofluorescence staining, after incubation with the secondary antibody conjugated to Alexa-Fluor-488 (Invitrogen, Courtaboeuf, France), the nuclei were counterstained with DAPI.

Measurement of inflammation markers (cytokines) by ELISA immunological assay. The levels of cytokines IL6, IL8, TNF-α, IFN-α, IFN-β were measured using an Enzyme-Linked ImmunoSorbent Assay (ELISA). Maxisorp Immuno 96-well ELISA plates (Nunc) were coated with either anti-IL-6, anti-IL-8, anti-IFN-α, anti-IFN-β, or anti-TNF-α antibodies in PBS overnight at 4°C.

After washing the plates with a low-salt wash buffer (10 mM Tris, pH 7.2, 25 mM sodium chloride, 0.05% Tween 20), the plates were blocked with blocking buffer (PBS with 1% BSA) at room temperature for two hours, followed by additional washes with wash buffer. The culture media from the skin explants were then tested undiluted or diluted 1/100 (IL-6) in low-salt wash buffer containing 1% BSA, and the plate was incubated at room temperature for two hours. After extensive washes, either anti-IL-6, anti-IL-8, anti-IFN-α, anti-IFN-β, or anti-TNF-α antibody (diluted in wash buffer containing 1% BSA) was added and incubated at room temperature for one hour.

Then, the secondary antibody conjugated to horseradish peroxidase (1/200) (ECL) was added and incubated at room temperature for twenty minutes. After extensive washes, the plates were incubated with TMB substrate at room temperature for approximately twenty minutes, after which a stop solution (2N H_2SO_4) was added, and the absorbance was measured at 450 nm using an ELISA plate reader.

Data analysis

The null hypothesis (H_0) in the statistical analysis posits that: "the control and treated groups have the same mean value for the concentration of a specific biomarker". In contrast, the alternative hypothesis (H_1) asserts that: "the biomarker concentration mean values differ between the two groups, indicating that the treatment has an effect on biomarker concentration compared to the control condition".

RESULTS

Macroscopic Morphological Aspects

In Figure 1, skin explants from the control group (not treated by NCH), maintained in culture for five days, can be observed. In the center of the skin explant, the induced scar can be seen. No morphological evolution was observed compared to the initial morphology of the scarred skin explants.

In Figure 2, on the fifth day of NCH, erythema appears to be present at the scar site. This type of erythema is typically associated with the presence of a local inflammatory reaction. This erythema is not observed in the scarred skin explants from the control group.

Measurement of proliferation markers Ki67 and K17 by immunohistochemistry

For each skin sample and each analyzed marker, a fluorescence image of the epidermis is captured using NIS Element software (Nikon®). Visual counting of positive cells was then conducted by Aquiderm for each sample and each marker (Rambert, 2019).

During the early stages of wound repair, the Ki67 marker is typically low (Prabhu et al., 2022). Accordingly, the fluorescence images clearly show a lower presence of Ki67 in the case of treated explants compared to untreated ones (Figure 3). This suggests that NCH treatment has contributed to the initiation of the wound repair process.

Unlike Ki67, Aquiderm did not measure a significant difference in the number of K17 markers between treated and untreated skin explants (Rambert, 2019). The same level of K17 expression was found in both cases (Figure 4).

Measurement of inflammation markers (cytokines) using the ELISA immunological test

The concentrations for the following cytokines, IL8, TNF-α, IFN-α, and IFN-β, were below the detection limit. Only IL6 showed a sufficiently high concentration to be

Figure 2. Photograph taken on the fifth day of the experiment. NCH-treated skin explants.

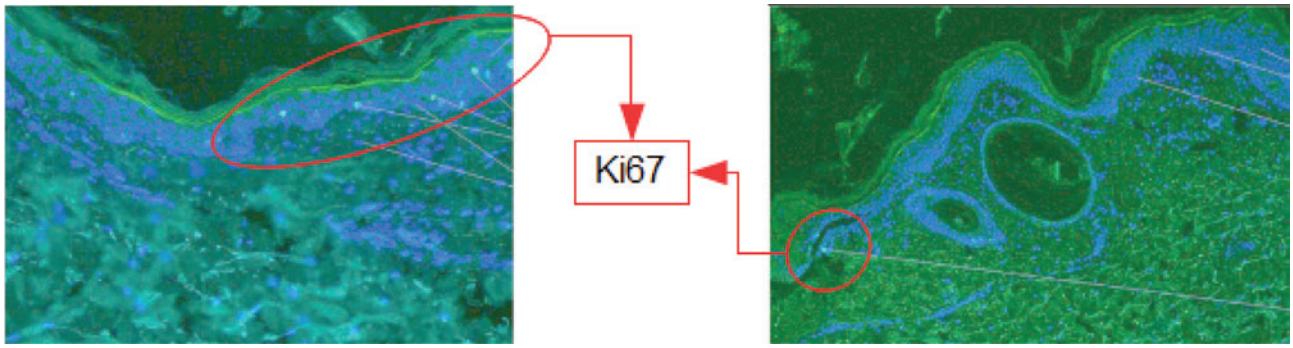


Figure 3. Fluorescence image for the detection of Ki67 on a control sample (left) vs treated (right) scarred skin explants. The bright green dots indicate Ki67 markers.

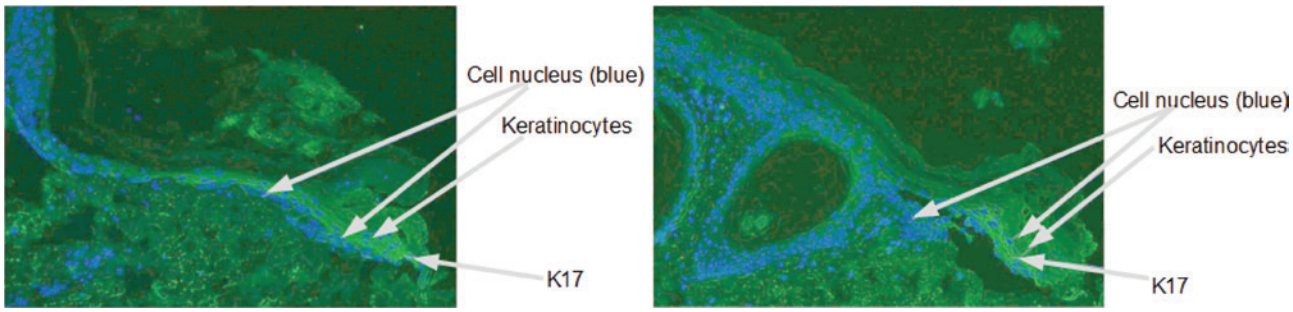


Figure 4. Fluorescence image for the detection of K17 in control sample (left) vs treated sample (right) of scarred skin explants.

measured in all scar tissues, treated or not, as shown in Figure 5.

The high levels of IL-6 measured in the supernatants of NCH-treated skin explants indicate a stronger local inflammation compared to untreated ones, which is consistent with the initial phase of the wound repair process described earlier. The concentration of IL-6 suggests a correlation between NCH treatment and the manifestation of wound repair in treated samples, while this manifestation is absent in untreated samples.

Since the sample sizes differ (six samples in the treated group and seven in the control group), and assuming unequal variances in IL-6 concentrations inside each group, a Welch's t-test—a variant of the Student's t-test that accounts for differences in group sizes and variances—is applied. By performing Welch's test on the IL-6

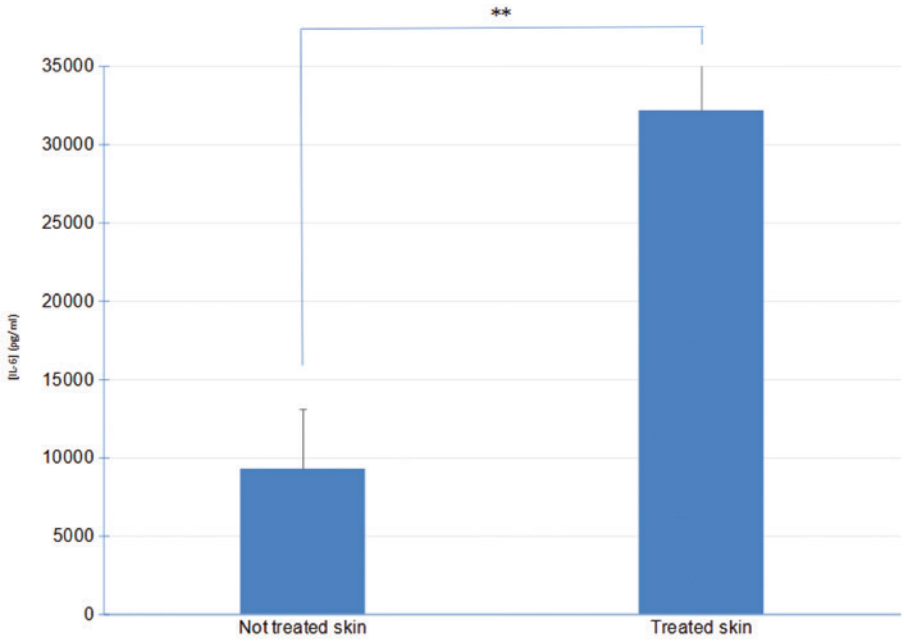


Figure 5. IL6 concentrations in cut skin explants. A p-value of $p < 0.05$ is considered statistically significant; in this case, $^{**}p < 0.01$.

concentration values from the treated and control groups, we obtain a p-value of 0.00407. This value is well below conventional significance thresholds, such as $\alpha = 0.05$ or even $\alpha = 0.01$, indicating that the probability of observing such a result under the null hypothesis (H_0) is very low (~0.4%). We therefore reject H_0 at both the 5% and 1% significance levels. This result provides strong statistical evidence of a difference in mean IL-6 concentrations between the treated and control groups, suggesting that the NCH treatment has a measurable effect.

DISCUSSION

The results of the NCH on skin explant experiment described above reveal two indicators that support the manifestation of a wound repair process in the treated group compared to the control group. The reduced presence of the Ki67 marker and the higher concentration of the IL6 cytokine are both indicative of the initial phase of the wound repair process. Therefore, this suggests that, most likely, the NCH-treated skin explants have undergone a more advanced wound repair process compared to the untreated skin explants.

During the course of the experiment, one of the authors held the 6-well culture plate in his hands to apply the heteronomic treatment. This holding is thought to have no consequences as there is no obvious reason why only Ki67 and IL6 would have been affected by it, contrary to other markers. It is worth noting that the 6-well culture plate for the two groups were also manually moved in and out of their CO_2 incubator.

While the results of this experiment are promising, they also highlight the challenge of selecting the most relevant markers to assess the wound repair process. In this case, the concentrations of IL8, TNF-α, IFN-α, and IFN-β were not measurable. If only these markers had been chosen, the experiment would not have yielded conclusive results. It is worth noting that to avoid this limitation, Aquiderm initially measured a broader set of inflammation markers, including 13 different cytokines, using multiplex assays (Rambert, 2023). These results were then confirmed through ELISA tests on selected cytokines.

Furthermore, this experiment shows that assessing the existence of NCH effects on biological organisms is facing many practical difficulties:

- our knowledge of external physical influences on biological samples is currently rather poor. Systematic trials should be done to characterize the sources of biological effects (electric or magnetic field, electromagnetic radiation, sound and ultrasound, etc.) and the magnitude of these effects in relation to the properties (frequency, power, etc.) of these sources. Hence, it is difficult to design an experiment that will isolate the samples from such unknown influences.

- This difficulty is further increased by the fact that these experiments are located at the frontier between biology and physics and require a good knowledge of both fields and their interactions.

Taking a skeptical position, we could require that one precisely measure physical influences around the skin samples, *e.g.*, static and variable electric, magnetic, and electromagnetic fields, including thermal and microwave radiations, potentially emanating from ovens, cell phones, refrigerators, extractor hood vibrations, etc. Adopting the same viewpoint, we could also require that the samples be isolated from these influences.

Although this seems to be a sensible proposal, it is not relevant here for the following reasons:

- Both the treated skin samples and control group were located in the same room, so both types of samples underwent the same influences from external fields;
- hand healers operate in their daily practice without isolating their patients from these influences;
- Furthermore, it may be possible that hand healers act as catalysts of surrounding fields that they are able to manipulate in order to cure. Within such a hypothesis, it may be counterproductive to isolate the samples from any such external physical influences.

The above-mentioned limitations underline the need for a close cooperation between physicists and biologists to design such experiments, ensuring any influence other than the one being assessed is effectively discarded, be it, *e.g.*, during the handling of the samples, their storing, or the experimental trials. For this type of experiment, the biological laboratory should ideally seek assistance from one or more physics advisors.

IMPLICATIONS AND APPLICATIONS

Although it seems too early at this stage to make assertions about the exact mechanism at play in the wound repair process through NCH, we can report some non-exhaustive hypotheses found in the scientific literature. Some studies (Baerga-Ortiz et al., 2000; Finkelstein, 2015; Bonnefoy, 1882; Burr, 1972; McCraty et al., 1998; Zhao et al., 1999; Oliveira et al., 2019; Becker, 2000) suggest a connection between electricity and biological mechanisms in the human body, notably wound repair. McCraty et al. (McCraty et al., 1998) explain how a small electric stimulus may have large biological effects through stochastic resonance (Benzi et al., 1981; McCraty et al., 1998). One of the authors initiated this study after measuring a low-intensity electric field from his hands that could be involved in the wound healing process. Such an electromagnetic cause is also supported by Rubik et al. (Rubik et al., 2015) and McCraty et al. (McCraty et al., 1998). Other studies (Hisamitsu et al., 1996; Moga & Bengston, 2010; Muehsam & Pilla, 2009a; Zimmerman, 1985) explore the influence of magnetic fields. Another potential explanatory mechanism could be biophoton emission by the human body (Popp & Chang, 1998; Hossu & Rupert, 2006; Rubik et al., 2015; Ives et al., 2014). Future studies of the underlying mechanisms may include: biochemical factors, notably other specific proteins, or assessment of changes in cell or tissue morphology. The variety of potential explanations (Markov, 2015) highlights the need for further experiments and theoretical advancements to establish the appropriate mechanism underlying the observed phenomena.

CONCLUSION

The results of the NCH experiment on human skin explants described here show two indicators of the initial phase of wound repair, linked to Ki67 and IL6 responses. This supports the hypothesis that this phase of wound repair occurred in the treated skin explants group, contrary to the control group.

This experiment points to a seemingly successful NCH application on human scarred skin and the possibility to perform such studies without being influenced by the placebo effect. Our results are detailed here to encourage further inquiry to better understand the parameters involved in the NCH mechanism.

In order to confirm, extend, and study the repeatability of our own findings, additional unbiased studies similar to ours need to be conducted and evaluated by peers. Some directions for extending this study could be, *e.g.*, working on more skin explants; using skin explants coming from different human races and/or donors; using vascularized skin explant (Chen et al., 2021); analyzing other wound repair markers (notably fibroblasts); isolating the sample and/or the hands from physical influences; analyzing other skin layers (notably the dermis, where fibroblasts are involved during the wound repair process). As NCH was historically associated with magnetism, it could also be interesting to isolate the sample from the influence of magnetic fields in a future study, in order to assess if traditional statements are scientifically grounded. Comparative studies may also

be undertaken to analyze the differences between NCH-based wound healing and other wound healing processes, such as, *e.g.*, drug treatments or physical therapies. Other further studies may explore individual variability of NCH wound healing in relation to: age, gender, or health parameters such as stress or fatigue. Another extension of this study may focus on double-blinded clinical trials to assess the NCH efficiency under various conditions. The corollary of these trials may be to investigate potential adverse effects of this practice or identifying adverse conditions giving no results. Psychological outcomes may also be considered, such as the impact of NCH on well-being and treatment quality perceptions.

It would be advisable to develop a standard protocol for NCH application and to conduct the aforementioned studies under these standardized conditions to ensure comparability.

ACKNOWLEDGMENTS

The authors would like to express their deep gratitude to the late Yves Lignon, Jean-Marie Le Gall, and Jérôme Rambert for helpful comments and discussions.

AUTHOR CONTRIBUTIONS

Arnault Richard de Chicourt: Conceptualization, Methodology, Investigation, Writing - Reviewing & Editing.
John Sadi: Methodology, Investigation, Writing - Reviewing & Editing.

FUNDING

Financial support for this research was provided by "ARC Formation" who contracted the Aquiderm biological laboratory, through ADERA SAS (L'Association pour le Développement de l'Enseignement et des Recherches auprès des Universités, des centres de recherche et des entreprises d'Aquitaine) and Bordeaux University. The "ARC Formation" representative was also involved in the study design, the experimental hand healing sessions, and in the decision to submit the article for publication.

DECLARATIONS OF INTEREST

None.

ENDNOTES

[1] Recent discoveries also point to the existence of giant magnetic filaments connecting the galaxies, stars, and planets throughout the whole universe (West, 2021).

REFERENCES

Baerga-Ortiz, A., Rezaie, A. R., & Komives, E. A. (2000). Electrostatic dependence of the thrombin–thrombomodulin interaction. *Journal of Molecular Biology, 296*(2), 651–658. https://doi.org/10.1006/jmbi.1999.3447

Barry, J. (1968). General and comparative study of the psychokinetic effect on a fungus culture. *Journal of Parapsychology, 32*(4), 237–243.

Becker, R. O. (2000). Effects of electrically generated silver ions on human cells and wound healing. *Electro- and Magnetobiology, 19*(1), 1–19.

Bedford, F. L. (2012). A perception theory in mind-body medicine: Guided imagery and mindful meditation as cross-modal adaptation. *Psychonomic Bulletin & Review, 19*(1), 24–45. https://doi.org/10.3758/s13423-011-0166-x

Belhoste, B. (2021). La condamnation du mesmérisme revisitée: Enquête sur les enquêtes officielles de 1784 sur le magnétisme animal. *Revue d'histoire des sciences humaines, 39,* 208. https://doi.org/10.4000/rhsh.6602

Benor, D. J. (2001). *Healing research: Volume I. Scientific validation of a healing revolution.* Southfield, MI: Vision Publications.

Benzi, R., Sutera, A., & Vulpiani, A. (1981). The mechanism of stochastic resonance. *Journal of Physics A: Mathematical and General, 14*(11), 453–457. https://doi.org/10.1088/0305-4470/14/11/006

Bonnefoy, E. (1882). *Guide pratique d'électrothérapie* (2nd ed.). Masson.

Burr, H. S. (1972). *Blueprint for immortality.* C. W. Daniel Company.

Charcot, J. M. (1892). *Oeuvres complètes de J. M. Charcot. Tome 1. Leçons sur les maladies du système nerveux* (6th ed., recueillies et publiées par Bourneville). Progrès médical; Louis Bataille Éditeur.

Chen, E. P., Toksoy, Z., Davis, B. A., & Geibel, J. P. (2021). 3D bioprinting of vascularized tissues for *in vitro* and *in vivo* applications. *Frontiers in Bioengineering and Biotechnology, 9,* 664188. https://doi.org/10.3389/fbioe.2021.664188

Conickx, C. (2023). (Re-)defining "animal magnetism": The mesmerism investigations of 1784. *La Révolution française.* https://doi.org/10.4000/lrf.7136

Dashkevich, N. M., Ovanesov, M. V., Balandina, A. N., Karamzin, S. S., Shestakov, P. I., Soshitova, N. P., Tokarev, A. A., Panteleev, M. A., & Ataullakhanov, F. I. (2012). Thrombin activity propagates in space during blood coagulation as an excitation wave. *Biophysical*

Journal, 103(11), 2233–2240. https://doi.org/10.1016/j.bpj.2012.10.011

Dave, J. M., & Bayless, K. J. (2014). Vimentin as an integral regulator of cell adhesion and endothelial sprouting. *Microcirculation, 21*(4), 333–344. https://doi.org/10.1111/micc.12111

Durville, H. (1900). *Theory and practice of human magnetism.* Psychic Research Company.

Durville, H., & Jagot, P. C. (1914). *Histoire raisonnée du magnétisme et du psychisme pratique.* Hector et Henri Durville Éditeurs.

Einstein, A. (1936). Physics and reality. *The Journal of the Franklin Institute, 221*(3), 349–382. https://doi.org/10.1016/S0016-0032(36)91047-5

Finkelstein, G. (2015). Mechanical neuroscience: Emil du Bois-Reymond's innovations in theory and practice. *Frontiers in Systems Neuroscience, 9,* 133. https://doi.org/10.3389/fnsys.2015.00133

Freud, S. (1891). Hypnosis. In *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 1, pp. 103–114).

Gabay, C. (2006). Interleukin-6 and chronic inflammation. *Arthritis Research & Therapy, 8*(Suppl 2), S3. https://doi.org/10.1186/ar1917

Grad, B. (1963). A telekinetic effect on plant growth. *International Journal of Parapsychology, 5*(2), 117–133.

Grad, B., Cadoret, R. J., & Paul, G. I. (1961). The influence of an unorthodox method of treatment on wound healing in mice. *International Journal of Parapsychology, 3*(2), 5–24.

Grad, B., & Schwarz, B. E. (1965). Some biological effects of the "laying on of hands": A review of experiments with animals and plants. *Journal of the American Society for Psychical Research, 59*(2), 95–127.

Guédron, M. (2009). L'imaginaire des fluides au XVIIIe siècle. *Sociétés & Représentations, 28,* 173–186. https://doi.org/10.3917/sr.028.0173

Hartman, D., & Zimberoff, D. (2013). Jung and hypnotherapy. *Journal of Heart-Centered Therapies, 16*(1), 3–52.

Hisamitsu, T., Seto, A., Nakazato, S., Yamamoto, T., & Aung, S. K. (1996). Emission of extremely strong magnetic fields from the head and whole body during oriental breathing exercises. *Acupuncture & Electro-Therapeutics Research, 21*(3–4), 219–227. https://doi.org/10.3727/036012996816356898

Hossu, M., & Rupert, R. (2006). Quantum events of biophoton emission associated with complementary and alternative medicine therapies: A descriptive pilot study. *Journal of Alternative and Complementary Medicine, 12*(2), 119–124. https://doi.org/10.1089/acm.2006.12.119

Ives, J. A., van Wijk, E. P. A., Bat, N., Crawford, C., Walter, A., Jonas, W. B., van Wijk, R., & van der Greef, J. (2014). Ultraweak photon emission as a non-invasive health assessment: A systematic review. *PLoS One, 9*(2), e87401. https://doi.org/10.1371/journal.pone.0087401

Jain, S., Hammerschlag, R., Mills, P., Cohen, L., Krieger, R., Vieten, C., & Lutgendorf, S. (2015). Clinical studies of biofield therapies: Summary, methodological challenges, and recommendations. *Global Advances in Health and Medicine, 4*(Suppl), 58–66. https://doi.org/10.7453/gahmj.2015.034.suppl

Jiang, W. G., Sanders, A. J., Ruge, F., & Harding, K. G. (2012). Influence of interleukin-8 (IL-8) and IL-8 receptors on the migration of human keratinocytes: The role of PLC-γ and potential clinical implications. *Experimental and Therapeutic Medicine, 3*(2), 231–236. https://doi.org/10.3892/etm.2011.402

Kaptchuk, T. J., & Miller, F. G. (2015). Placebo effects in medicine. *The New England Journal of Medicine, 373*(1), 8–9. https://doi.org/10.1056/NEJMp1504023

Kircher, A., (1641). *Magnes, sive de arte magnetica opus tripartitum.* Ludouici Grignani.

Krieger, D., Peper, E., & Ancoli, S. (1979). Therapeutic touch: Searching for evidence of physiological change. *The American Journal of Nursing, 79*(4), 660–662. https://doi.org/10.2307/3462338

Lakhdari, S. (2007). Hypnose, hystérie, extase: De Charcot à Freud. *Savoirs et clinique, 8,* 201–209. https://doi.org/10.3917/sc.008.0201

Landén, N. X., Li, D., & Ståhle, M. (2016). Transition from inflammation to proliferation: A critical step during wound healing. *Cellular and Molecular Life Sciences, 73*(20), 3861–3885. https://doi.org/10.1007/s00018-016-2268-0

Laurent, P., Jolivel, V., Manicki, P., Chiu, L., Contin-Bordes, C., Truchetet, M. E., & Pradeu, T. (2017). Immune-mediated repair: A matter of plasticity. *Frontiers in Immunology, 8,* 454. https://doi.org/10.3389/fimmu.2017.00454

Lignon, Y. (1989, August 29–September 6). Méthodologie statistique et phénomènes dits parapsychologiques: Historique et discussion. *47th Session of the International Statistical Institute,* Paris.

Lignon, Y., & Danier, R. (1984, September 26–October 24). Analyse statistique des données d'une expérience sur l'eau "magnétisée" par J. M. Le Gall. *Centre Hospitalier Villejuif*.

Markov, M. S. (Ed.). (2015). *Electromagnetic fields in biology and medicine.* CRC Press. https://doi.org/10.1201/b18148

McCraty, R., Atkinson, M., Tomasino, D., & Tiller, W. A. (1998). The electricity of touch: Detection and measurement of cardiac energy exchange between people. In R. J. Davidson & V. L. Scherer (Eds.), *Brain and values: Is a biological science of values possible?* (pp.

359–379). Lawrence Erlbaum Associates. https://doi.org/10.4324/9780203763834-16

Mesmer, F. (1779). *Mémoire sur la découverte du magnétisme animal.* Didot.

Moga, M. M., & Bengston, W. F. (2010). Anomalous magnetic field activity during a bioenergy healing experiment. *Journal of Scientific Exploration, 24*(3), 397–413.

Muehsam, D. J., & Pilla, A. A. (2009a). A Lorentz model for weak magnetic field bioeffects: Part I—Thermal noise is an essential component of AC/DC effects on bound ion trajectory. *Bioelectromagnetics, 30*(6), 462–475. https://doi.org/10.1002/bem.20494

Muehsam, D. J., & Pilla, A. A. (2009b). A Lorentz model for weak magnetic field bioeffects: Part II—Secondary transduction mechanisms and measures of reactivity. *Bioelectromagnetics, 30*(6), 476–488. https://doi.org/10.1002/bem.20493

Newton, I. (1846). *The mathematical principles of natural philosophy* (A. Motte, Trans.). Daniel Adee. (Original work published 1687)

Nosbaum, A., Prevel, N., Truong, H. A., Mehta, P., Ettinger, M., Scharschmidt, T. C., Ali, N. H., Pauli, M. L., Abbas, A. K., & Rosenblum, M. D. (2016). Cutting edge: Regulatory T cells facilitate cutaneous wound healing. *Journal of Immunology, 196*(5), 2010–2014. https://doi.org/10.4049/jimmunol.1502139

Oliveira, K. M. C., Barker, J. H., Berezikov, E., Pindur, L., Kynigopoulos, S., Eischen-Loges, M., Han, Z., Bhavsar, M. B., Henrich, D., & Leppik, L. (2019). Electrical stimulation shifts healing/scarring towards regeneration in a rat limb amputation model. *Scientific Reports, 9,* 11433. https://doi.org/10.1038/s41598-019-47389-w

Popp, F. A., & Chang, J. J. (1998). The physical background and the informational character of biophoton emission. In J. J. Chang, J. Fisch, & F. A. Popp (Eds.), *Biophotons* (pp. 238–250). Springer. https://doi.org/10.1007/978-94-017-0928-6_18

Prabhu, V., Rao, B., Rao, A., Prasad, K., & Mahato, K. K. (2022). Photobiomodulation invigorating collagen deposition, proliferating cell nuclear antigen and Ki67 expression during dermal wound repair in mice. *Lasers in Medical Science, 37*(1), 171–180. https://doi.org/10.1007/s10103-020-03202-z

Raoul, F. (2021). *Tout est lié.* Leduc.

Rambert, J. (2019). Rapport d'analyse des résultats: Étude de l'électromagnétisme sur explants de peaux humaines (Study No. AD 19-439). Aquiderm.

Rambert, J. (2023, February 20). [Private communication].

Rubik, B., Muehsam, D., Hammerschlag, R., & Jain, S. (2015). Biofield science and healing: History, terminology, and concepts. *Global Advances in Health and Medicine, 4*(Suppl), 8–14. https://doi.org/10.7453/gahmj.2015.038.suppl

Souza, A. L. T. de, Carvalho Rosa, D. P., Blanco, B. A., Passaglia, P., & Stabile, A. M. (2017). Effects of therapeutic touch on healing of the skin in rats. *Explore, 13*(5), 333–338. https://doi.org/10.1016/j.explore.2017.06.006

Thouret, M.-A. (1784). *Recherches et doutes sur le magnétisme animal.* Prault.

Tipei, J. F. (2001). *The laying on of hands in the New Testament* (Doctoral dissertation). University of Sheffield.

Weller, K., Foitzik, K., Paus, R., Syska, W., & Maurer, M. (2006). Mast cells are required for normal healing of skin wounds in mice. *FASEB Journal, 20*(13), 2366–2368. https://doi.org/10.1096/fj.06-5837fje

Werner, S., Krieg, T., & Smola, H. (2007). Keratinocyte–fibroblast interactions in wound healing. *Journal of Investigative Dermatology, 127*(5), 998–1008. https://doi.org/10.1038/sj.jid.5700786

Wilkinson, H., & Hardman, M. (2020). Wound healing: Cellular mechanisms and pathological outcomes. *Open Biology, 10*(9), 200223. https://doi.org/10.1098/rsob.200223

Zhang, X., Yin, M., & Zhang, L. J. (2019). Keratin 6, 16 and 17—Critical barrier alarmin molecules in skin wounds and psoriasis. *Cells, 8*(8), 807. https://doi.org/10.3390/cells8080807

Zhao, M., Dick, A., Forrester, J. V., & McCaig, C. D. (1999). Electric field-directed cell motility involves up-regulated expression and asymmetric redistribution of the epidermal growth factor receptors and is enhanced by fibronectin and laminin. *Molecular Biology of the Cell, 10*(4), 1259–1276. https://doi.org/10.1091/mbc.10.4.1259

Zimmerman, J. (1985). New technologies detect effects of healing hands. *Brain/Mind Bulletin, 10*(3), 3.

Journal of Scientific Exploration
Anomalistics and Frontier Science

RESEARCH ARTICLE

Deciphering the Zodiac Killer: A Killer Betrayed by his own Words

Drew H. Beeson
drewbeeson@yahoo.com
Deneen M. Shreve

SUBMITTED June 6, 2023
ACCEPTED December 7, 2024
PUBLISHED October 15, 2025

https://doi.org/10.31275/20253043

HIGHLIGHTS

A new analysis of the Zodiac killer case argues that Donald Lee Cheney, not Arthur Leigh Allen, is the stronger suspect—based on a structured evidentiary principle rather than speculation.

ABSTRACT

Between December 1968 and October 1969, an unknown man terrorized the San Francisco Bay Area of California, murdering five people and wounding two others. The murderer adopted the moniker Zodiac and proceeded to mail taunting letters, cards, and cryptograms to law enforcement and newspapers, possibly leading to clues to his identity. For 55 years, countless investigators, professional and amateur, have been fascinated by the unsolved Zodiac killer murders, and dozens of authors have put forward dozens of men as possible Zodiac suspects, but their arguments supporting one Zodiac person of interest over others have often been based on vague reasoning without solid supporting evidence. This paper attempts to address this fault by using a well-defined principle of evidentiary analysis to analyze facts and competing hypotheses. Specifically, this paper will use the surprise principle to examine some important characteristics of two of the major players in the Zodiac killer mystery: Arthur Leigh Allen (the most discussed suspect) and Donald Lee Cheney (the man who brought Allen to law enforcement's attention), concluding that Cheney is the better of the two suspects.

KEYWORDS

Zodiac killer, serial killer, Don Cheney, Arthur Leigh Allen, surprise principle.

THE SURPRISE PRINCIPLE APPLIED TO THE ZODIAC KILLER CASE

It is undisputed that serial killings are the rarest form of homicide (Ellerbrok, 2011). With the rise in interest over the past few years in what is simply known as "True Crime," the public's fascination with serial killings is at an all-time high, resulting in numerous T.V. documentaries, videos, podcasts, and books on serial killers, such as Jeffery Dahmer, Ted Bundy, and Gary Ridgway (a.k.a. the Green River Killer). The explosion of content examining these killers and their monstrous crimes has produced a unique opportunity to learn what inspired these individuals to act upon their murderous impulses, what mistakes led to their apprehension, and what, if anything, can be found in their backgrounds that contributed to their behaviors. A deeper study of serial killers allows even casual true crime

researchers to challenge the way that evidence is gathered and interpreted, particularly considering the advancements in DNA technology.

The unsolved case of the Zodiac killer, steeped in mystery, has garnered the fascination of amateur sleuths and has significantly shaped the public's perception of serial killings. Examining this case presents an opportunity to show how we determine which facts are relevant, how we reason from our chosen facts, and how confirmation bias may subconsciously influence our conclusions.

Fifty years ago, a brutal murderer terrorized the San Francisco Bay Area. Calling himself the Zodiac, the killer used the media to taunt the police and terrify the public. In the words of a contemporary law enforcement official from the Napa Sheriff's Department, "We have reason to believe he is a maniac; however, he is a cunning man. He knows exactly what moves he's going to make" (Frederick & Lindsey 2019, 13:50).

The Zodiac was cunning enough or lucky enough to escape capture, and the identity of the Zodiac killer remains one of America's greatest mysteries. Over the past 50 years, dozens of authors have put forward dozens of men as possible Zodiac suspects, but their arguments supporting one Zodiac person of interest over others have largely rested on imprecise methods of reasoning without regard for what comprises good, reliable evidence. In order to properly analyze facts and competing hypotheses, investigators need to use well-defined principles of evidential support. One such principle is the Surprise Principle. As Elliot Sober writes in *Core Questions in Philosophy,* "The Surprise Principle describes when an observation O strongly favors one hypothesis (H_1) over another (H_2)." (Sober, 34) This principle says that an observation O strongly supports hypothesis H_1 over Hypothesis H_2 if both the following conditions are satisfied, but not otherwise: (1) if H_1 were true, O is to be expected; and (2) if H_2 were true, O would have been unexpected (Sober, 2021).

This principle (even if not identified as such) is widely used across disciplines, including criminal investigations and legal cases. The best explanation will be the hypothesis that leads us to expect the data better than alternative hypotheses do. The surprise principle does not tell how probable the target hypothesis is. Instead, it is used to ascertain which of two or more competing hypotheses are supported by the facts. It tells us when facts strongly support one hypothesis over another. Normally, H predicting O means that H at least makes O more probable than not (i.e., greater than ½). The surprise principle covers these cases, but it also covers cases in which neither hypothesis predicts the data, but rather, H_1 makes O more probable than does H_2, and where neither H_1 nor H_2 makes O more probable than not.

This is important in forensic science. For example, the genetic data that show that two persons are related as siblings usually involve huge improbabilities. It is just that the sibling hypothesis makes the genetic data less improbable than the alternative hypothesis. But also, in criminal cases, there is often data that is less surprising/improbable given the defendant's guilt, although the defendant's guilt does not lead us to expect the data. For example, a Raleigh cigarette is found at the crime scene, and the defendant smokes that brand. It is not that the guilt of the defendant leads us to expect that a Raleigh cigarette would be found, but that fact may be more probable given that the defendant smokes Raleighs than if some other person committed the crime.

In short, we are speaking of H_1 better fitting data than H_2, where the better fit involves H_1 conferring a greater probability on a datum even if the datum is still improbable given H_1. It does this by focusing on which hypothesis makes the observational datum more probable (and so less surprising) than does an alternative hypothesis. In this way, the surprise principle identifies observations that discriminate between two hypotheses, and thereby evidentially favors one over the other.

The surprise principle will be used in an examination of some characteristics of two of the major players in the Zodiac killer mystery: Arthur Leigh Allen and Donald Lee Cheney. Arthur Leigh Allen, the best known and, to many, the most likely Zodiac killer suspect, was brought to police attention in this case by his friend Donald Lee Cheney, who in July of 1971, informed the Manhattan Beach, California Police Department that Allen, before the Zodiac crimes occurred, had spoken to him of his desire to commit Zodiac-type murders at one of the actual murder scenes. There is much evidence, to be discussed later, pointing to Allen as the killer, and environmental criminologist D. Kim Rossmo, Ph.D., writing in "Geographic Profile: Zodiac Serial Murders," indicates that Vallejo, California (where Allen lived) is within the geographic boundaries where the Zodiac killer most likely had his residence (Rossmo, 1999).

As of late, many investigators, including these authors, have begun to examine further Don Cheney's role in the Zodiac killer saga and have found evidence, which will be discussed later, indicating that Cheney was more than an informant – he was possibly the Zodiac killer himself. Comparing evidence for Don Cheney as the Zodiac killer to evidence for Arthur Leigh Allen as the Zodiac killer will be the

focus of this work, and the surprise principle will be utilized to show that there are important facts that strongly support the Cheney-as-Zodiac hypothesis over the Allen-as-Zodiac hypothesis. This analysis does not show that the Allen hypothesis is implausible, all things considered, but it does provide salient evidential considerations that potentially undermine arguments favorable to the Allen hypothesis. We will show that the Cheney hypothesis makes the data in the case less improbable (or more probable) than does the Allen hypothesis.

This comparison will demonstrate that Don Cheney's attributes/characteristics are a superior match to many of the facts that are known about the Zodiac persona, as listed below, and do not support prime suspect Arthur Leigh Allen as the perpetrator of the Zodiac crimes. We will also consider the Zodiac's physical characteristics as described by eyewitnesses, and in the same manner demonstrate that these physical characteristics more closely match those of Don Cheney than those of Arthur Leigh Allen.

The Zodiac Killer Persona:

1. An advanced knowledge of mathematics
2. Demonstrated sewing skills
3. An interest in comics
4. A big-game hunter
5. Proficiency with knives
6. Knowledge of celestial navigation
7. Drafting knowledge (ability to alter handwriting)
8. A shrewd and methodical planner
9. Profiled as an age-appropriate heterosexual male

Physical Characteristics of the Zodiac Killer (as described by eyewitnesses):

1. Height: six feet tall
2. Weight: 200-250 lbs.
3. Build: stocky and barrel-chested
4. Hair: brown/dark
5. Age: 35-40 years old
6. Wore eyeglasses

THE ZODIAC KILLER CRIMES

The First Attack: December 20, 1968

Five days before Christmas, on a typically cool night in Northern California, gunshots rang out, killing two high school students, Betty Lou Jensen and David Faraday (Zodiac Killer Facts, n.d.). They were on their first date, sitting in a car on a turnout, a local lovers' lane, on Lake Herman Road, which connects Benicia and Vallejo. Several months went by with no arrest in the murders and no clues pointing to a motive ("Lake Herman Road," n.d.) (See Figure 1).

The Second Attack: July 4, 1969 (possibly early morning hours of July 5th)

The following summer, 22-year-old Darlene Ferrin and 19-year-old Michael Mageau were shot in the same manner as Jensen and Faraday - as they sat in Darlene's car in the parking lot of Blue Rock Springs Park in Vallejo, California, just four miles from the location where the first couple had been murdered (See Figure 2). One of the victims, Michael Mageau, survived the shooting and provided a description of the killer to the police. A pattern began to emerge - a killer was targeting couples in isolated areas (Zodiac Killer Facts, n.d.).

Figure 1. David Faraday and Betty Lou Jensen.

Note. From Zodiac Killer Facts (n.d.). This image is in the public domain.

Figure 2. Darlene Ferrin and Michael Mageau.

Note. From The True Crime Database (n.d.). This image is in the public domain.

Weeks later, three letters, postmarked July 31, claiming credit for the crimes and providing details of the attacks, were sent to three San Francisco Bay Area newspapers. Each of the letters contained part of a cipher, a message within a cryptic code. These were to be the first of four ciphers sent by the killer that he claimed, if solved, would ultimately reveal his identity (See Figure 3).

A few days later, another letter, postmarked August 4, was received by the San Francisco Examiner (See Figure 4). It began with the words *Dear Editor, This is the Zodiac speaking.*

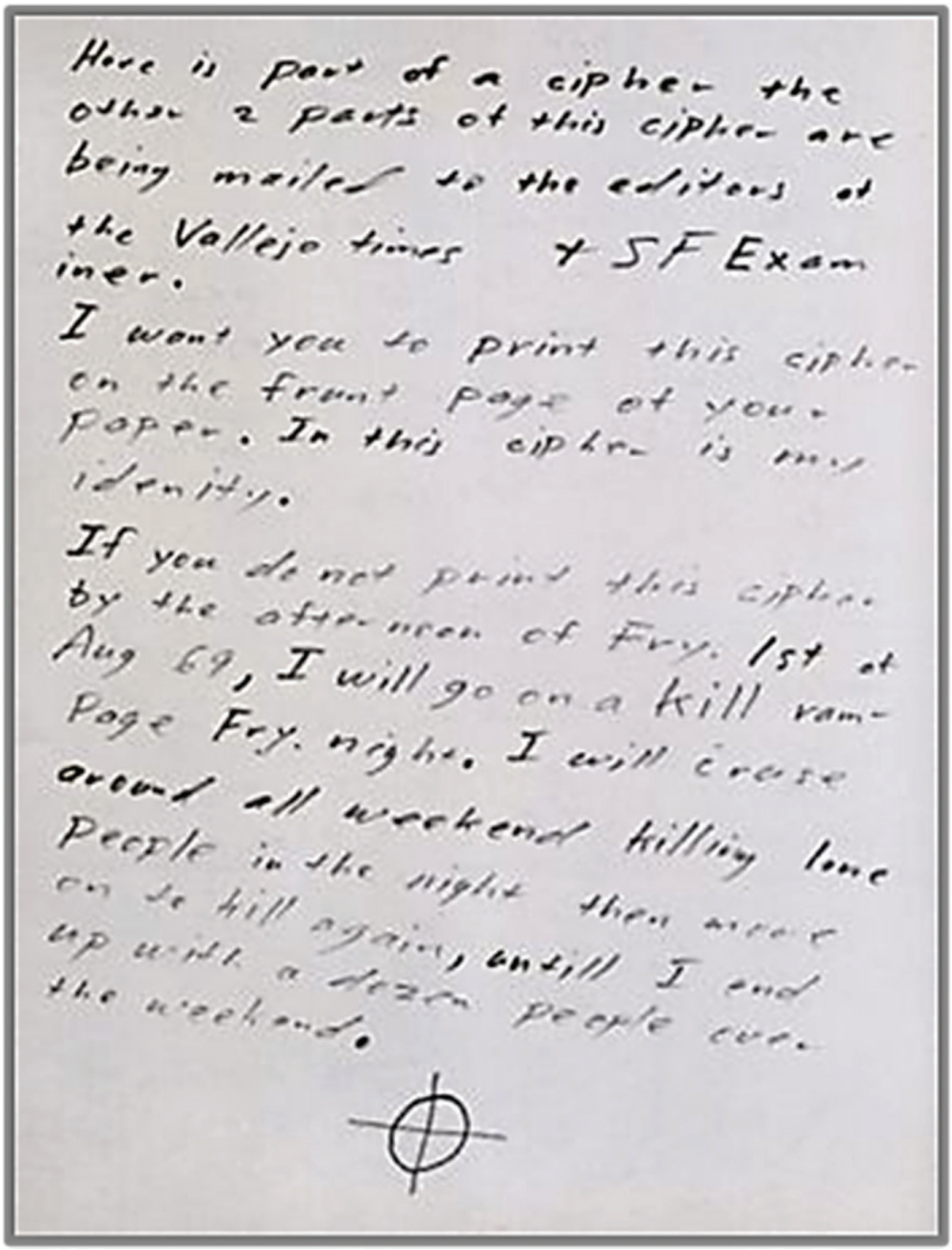

Here is part of a cipher the other 2 parts of this cipher are being mailed to the editors of the Vallejo times & SF Examiner.
I want you to print this cipher on the front page of your paper. In this cipher is my identity.
If you do not print this cipher by the afternoon of Fry. 1st of Aug 69, I will go on a kill rampage Page Fry. night. I will cruise around all weekend killing lone People in the night then after on to kill again, until I end up with a dozen people or the weekend.

Figure 3. Zodiac letter, July 31, 1969.

Note. From Zodiac Killer Facts (n.d.) This image is in the public domain.

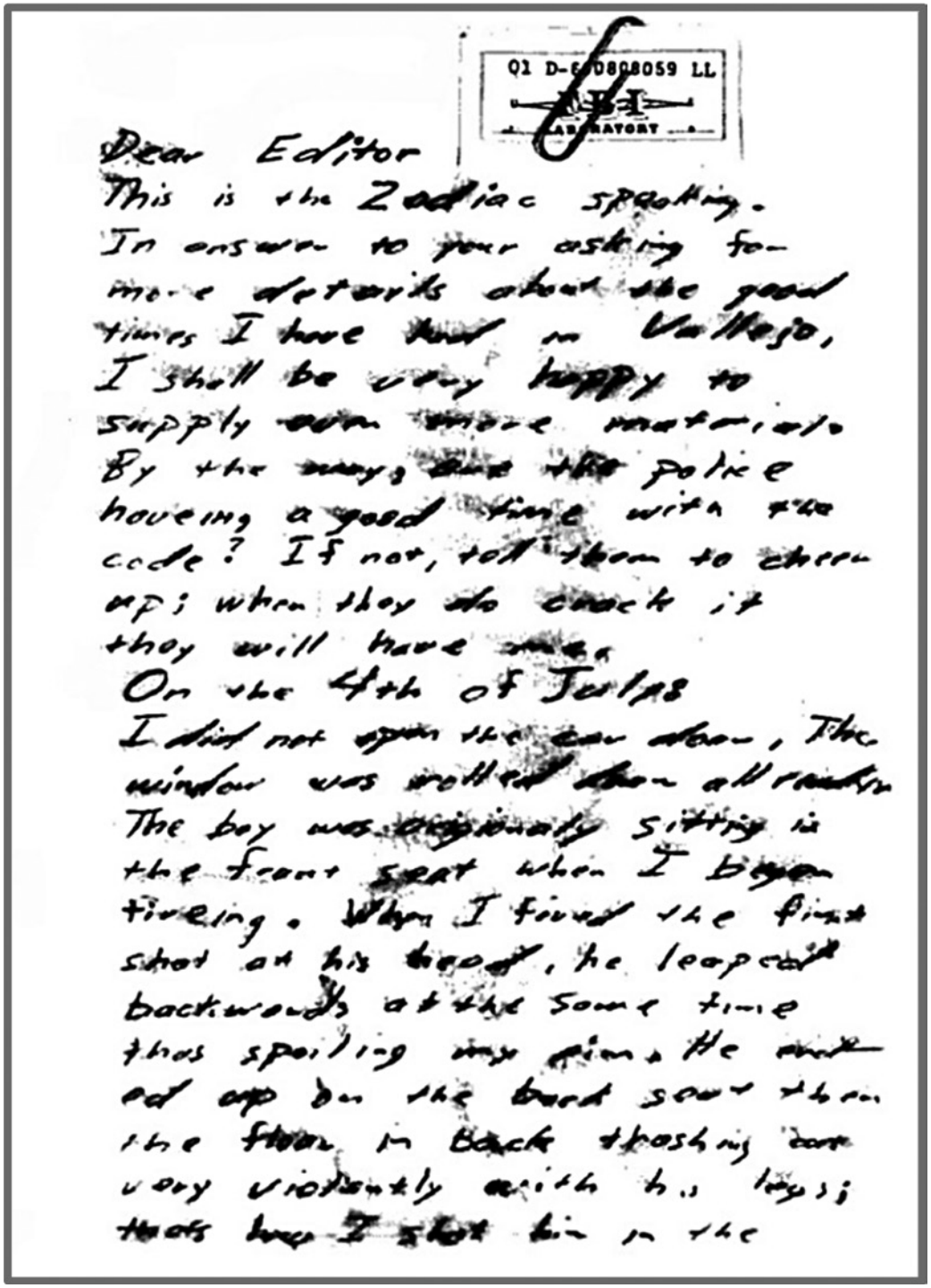


Figure 4. "This is the Zodiac speaking" letter.

Note. From Zodiac Killer Facts (n.d.). This image is in the public domain.

The Third Attack: September 7, 1969

While enjoying the afternoon at Lake Berryessa in Northern California, Bryan Hartnell and Cecelia Shepard were bound and stabbed repeatedly by a man who had been hiding behind a tree (Zodiac Killer Facts, n.d.) (See Figure 5). Bryan survived the attack and later gave a detailed description of the perpetrator to the police, but Cecelia succumbed to her wounds and passed away two days later.

Figure 5. Cecelia Shepard and Bryan Hartnell.

Note. From Zodiac Killer Facts (n.d.). This image is in the public domain.

Figure 6. Drawing of Lake Berryessa attacker.

Note. From Zodiac Killer Facts (n.d.). This image is in the public domain.

One detail Bryan recalled was that the attacker wore a black executioner's hood covering his face. The hood came over the attacker's chest area and displayed the Zodiac cross-circle symbol (Narlow, n.d.) (See Figure 6).

The Fourth and Final Attack: October 11, 1969

In Presidio Heights, an upscale neighborhood in San Francisco, Paul Stine, a 29-year-old cab driver, was shot in the right side of the head by a passenger who fled the scene and was never identified.

Three teenagers, looking out of a second-story window, witnessed a man presumed to be a murderer get out of Sine's cab, wipe down the outside of the vehicle, and calmly walk away. The famous Zodiac composite sketch is based on their descriptions of the killer. Initially, this crime appeared to be unrelated to the Zodiac killer attacks, but a few days after the murder, the San Francisco Chronicle received a letter, postmarked October 13, 1969, from the Zodiac in which he claimed to be the passenger responsible for Stine's murder. To prove his claim, the Zodiac included a piece of Paul Stine's bloody shirt in the letter (Zodiac Killer Facts, n.d.) (See Figures 7, 8 and 9).

Figure 7. Paul Stine.

Note. From Cole (2015). Thisi mage is in the public domain.

Figure 8. Sketch of the murderer of Paul Stine.

Note. From Roback (2023). This image is in the public domain.

Figure 9. Crime scene photo of the Paul Stine murder.

Note. From Zodiac Killer Facts. (n.d.). This image is in the public domain.

The last confirmed Zodiac killer attack occurred over 50 years ago, and despite the efforts of law enforcement and amateur investigators alike, the killer has yet to be identified. The public's fascination with the case reached its pinnacle with the 2007 release of the major motion picture *Zodiac* by acclaimed film director David Fincher. The movie, based on Robert Graysmith's nonfiction books *Zodiac*, published in 1986, and *Zodiac Unmasked*, published in 2007, focuses on a man named Arthur Leigh Allen, who had been the prime suspect in the case almost from the beginning.

Allen landed squarely on police radar as a person of interest in July 1971 after his close friend, Donald Lee Cheney, came forward with an explosive story Just a few months after Paul Avery of the *San Francisco Chronicle* had received the infamous Zodiac Halloween card (See Figure 10). Allen had told him on New Year's Day 1968 that he was going to target and kill couples on lovers' lanes and call himself Zodiac (See Figures 11, 12, 13 and 14). Cheney explained that his memory of this event had been triggered by reading a newspaper article that included a quote from one of the Zodiac letters in which the Zodiac threatened to kill school children as they came off a school bus. Cheney said he recalled that Allen had said this very thing.

In addition to Cheney's bombshell accusation, a mountain of evidence implicated Allen. One incriminating fact was Allen's possession of a Zodiac brand wristwatch, which his mother had given to him as a Christmas present in 1967. This particular watch featured a cross-circle logo, similar to both the symbol displayed by the Zodiac killer on his correspondence and the embellishment on the executioner's hood worn by the killer during the Lake Berryessa attack. Allen was also known for his reprehensible behavior. He lost his job as a schoolteacher in 1968 for inappropriately touching some of his students and was arrested for molesting an eight-year-old boy in 1974 (Zodiac Killer, n.d.).

The DVD version of the film *Zodiac*, released in 2008, came with a documentary called *His Name was Arthur Leigh Allen*. This documentary details the evidence against Allen. The film features interviews with many people who knew Arthur Leigh Allen, including Donald Lee Cheney; Allen's acquaintance, Santo "Sandy" Panzarella (also Cheney's friend and employer at the time of the Zodiac crimes); Allen's

Figure 10. Zodiac's Halloween Card.

Note. From Grinnell (n.d.). This image is in the public domain.

Figure 11. Arthur Leigh Allen, 1960s.

Note. From Zodiac Killer. (n.d.). This image is in the public domain.

Figure 12. Donald Lee Cheney.

Note. From Find a Grave. (n.d.). This image is in the public domain.

close friend, Norman Boudreau; and various law enforcement officers who had originally worked on the Zodiac case.

Most notable among the law enforcement participants was Detective George Bawart, a Napa detective who inherited the Zodiac case in the early 1990s after all the original

Figure 13. Arthur Leigh Allen, 1970.

Note. From The True Crime Database (n.d.). This image is in the public domain.

Figure 14. Don Cheney, 1965.

Note. From Beeson (2019). This image is in the public domain.

investigators had retired or passed away. Bawart, the final lead investigator on the Zodiac case, was convinced that Allen was indeed the Zodiac killer (Bawart, n.d.). Bawart wanted to be the detective who finally solved the case. He was highly disappointed when a fellow police officer called him from Allen's residence on August 26, 1992, telling him that Allen had been found dead. Arthur Leigh Allen had died of a heart attack.

The Graysmith book and the Fincher film did a fine job of raising suspicion of Arthur Leigh Allen by portraying him as a loner who was single due to his many odd behaviors, which included his propensity to be sexually attracted to school-age children. That served as the platter on which to place the seemingly overwhelming amount of evidence against Allen, including (a) the Zodiac watch that Allen wore with pride and (b) the fact that Allen was known to misspell words for comedic effect (e.g., *aigs,* meaning eggs, on his grocery list) in a manner similar to the Zodiac's in his letters (e.g., *clews* for the word clues and *Paradice* for the word Paradise).

His Name was Arthur Leigh Allen, and the book was made with the intent to explain why Arthur Leigh Allen had emerged as the prime suspect in one of the most notorious unsolved crimes in American history. This documentary did manage to achieve this goal, but it also had the unintended consequence of making Don Cheney look suspicious in his interviews. At one point in the film, Detective George Bawart is quoted as saying, "Yes, I believe Don Cheney's story [that Allen told Cheney that he wanted to be a killer called Zodiac]; I wonder sometimes if he's [Cheney's] not more involved in the case than he wants to let on" (Prior 2008, 20:33) Allen's close friend from his younger days, Norman Boudreau, also had his reservations about Cheney's character, stating in the documentary, "I met Don Cheney maybe two or three times. I really didn't get to know the guy. He made me feel uneasy, and I couldn't tell you why" (Prior 2008, 23:29).

In the documentary, Don Cheney states that the day Allen first told him that he wanted to become a killer named Zodiac was New Year's Day 1969; however, in the original San Francisco Police files, Cheney states that this conversation happened in late 1967 or in early 1968. Cheney reiterates the early 1968 date in a report prepared by Detective George Bawart in the early 1990s: "In January 1968, Allen had a conversation with Donald Cheney, a friend of his. Allen guised [sic] this conversation as though he was [sic] going to write a novel. Allen indicated to Cheney that he would call himself Zodiac and use the Zodiac watch as his symbol" (Bawart, n.d.).

On his ZodiacKiller.com website, long-time Zodiac researcher Tom Voigt stated that he interviewed Don Cheney in early 2000 and that Cheney had made many suspicious and contradictory statements during this interview. In one contradiction, Cheney stated that he was now sure that the date of Allen's "confession" was New Year's Day 1969. Cheney also told Voigt that he had never heard

of Blue Rock Springs Park, which contradicts his statement in *His Name was Arthur Lee Allen* that Allen had taken him to Blue Rock Springs Park on New Year's Day 1969 to show him where he wanted to kill a couple.

Also, in the *His Name was Arthur Leigh Allen* documentary, Cheney claimed that he would lick postage stamps for Allen (Prior, 2008). Could this be an attempt to cover himself in case his DNA was found on a postage stamp from one of the confirmed Zodiac mailed correspondences? After Don Cheney made the claim that he had licked Allen's stamps for him, he stated that he had given Allen his thumbprint in a ball of paraffin wax (Prior, 2008). San Francisco Police Department (SFPD) Detective George Bawart said that he did get Cheney's fingerprints compared to the Zodiac's, and they were not a match. When asked by the producer during the documentary if Cheney's DNA had been analyzed, Bawart responded, "I don't think so" (Prior 2008, 22:46).

Allen's DNA was tested against a DNA sample found on the top of a stamp from one of the Zodiac letters, but the results came back negative (Zodiac Killer Facts, n.d.). After Cheney mailed a letter to Zodiac killer researcher Tom Voigt in 2003, Voigt alerted authorities that the handwriting in Cheney's letter looked very similar to the handwriting in the Zodiac's letters. As a result, Cheney's DNA was reported to have been tested against a DNA sample held by the SFPD, and it was also not a match (Zodiac Killer Facts, n.d.). It remains unknown if a viable DNA sample from the Zodiac killer even exists.

In fact, at this point, it is questionable that the evidence held by the SFPD is even useful in determining the Zodiac killer's identity. In the words of Harry Phillips, producer of a 2002 ABC News Primetime Thursday television show about the Zodiac killer, who had access to the SFPD evidence storage facility, "The evidence and the files were in an atrocious state. It was unbelievable, considering that we were dealing with multiple murders. And the case had so much mystique internally that the evidence had been stolen, rifled, and taken home by retired cops" (Russo, 2018). To make matters worse, in 2002, the *San Francisco Chronicle* reported that among American cities, the SFPD ranked dead last in solving violent crime (Derbeken, 2002).

After Joseph DeAngelo, the infamous Golden State Killer, was arrested based on DNA evidence, hope that DNA could identify the Zodiac killer arose anew. In early 2018, it was reported that the Vallejo Police Department (VPD) was sending its Zodiac killer letters for DNA testing, using DNA obtained from the envelope flaps and stamps (Associated Press, 2018; Fagan, 2018). It has been over six years, and the VPD has yet to announce any test results. The contamination of the DNA found on the Zodiac letters, the improper storage of evidence, and the unprofessionalism of the SFPD have complicated what was already a confusing situation regarding the Zodiac killer's potential DNA.

Another confusing situation concerns the Zodiac's fingerprints. The Zodiac killer was meticulous in his efforts to leave no physical evidence at the crime scene or on his correspondence. In one of his letters, the Zodiac claimed that he wore transparent fingerprint guards made of airplane cement (Wark, n.d.).

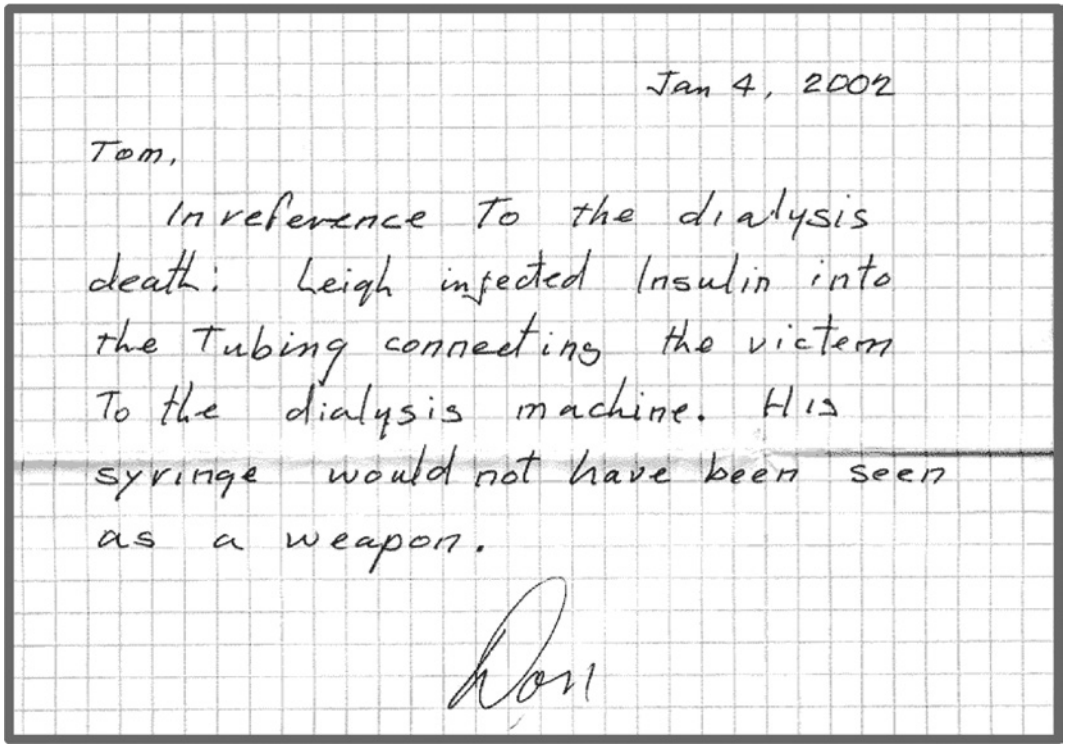
Moments after the brutal murder of cab driver Paul Stine at the hands of the Zodiac killer in October 1969, three siblings named Robbins saw the killer wiping down the outside of the cab in which the murder had taken place. Law enforcement interpreted this action as an attempt to remove any fingerprints that may have been left on the cab. The FBI lifted approximately thirty latent fingerprints from Paul Stine's cab. It was later determined that two of the prints belonged to Paul Stine, one to an unidentified police officer, and one to a newspaper reporter (Wark, n.d.). It is not known if the fingerprints from any responding paramedics were taken and eliminated. Fingerprints taken from the Zodiac crime scenes have never matched those of any suspect, including Arthur Leigh Allen.

In addition to examining the crime scenes for fingerprints and other clues, law enforcement officials have examined the Zodiac letters, looking for clues to the writer's identity. In early 2002, Tom Voigt reported that he had received from Don Cheney a handwritten letter in which the word victim was misspelled in the same manner as the Zodiac killer had misspelled that word: victem.

As written by Tom Voigt on Zodiackiller.com: "In late 2002, I sent scans of the envelope and letter to the San Francisco Police Dept (See Figure 15). Apparently finding the handwriting to be highly suspicious, the department immediately requested that I send them the originals. Within a month or two, the department obtained a DNA sample from Cheney. It was not a match to the Zodiac."

DISCUSSION

In the 2007 documentary *His Name was Arthur Leigh Allen,* former Vallejo Police Detective George Bawart


Jan 4, 2002

Tom,

In reference To the dialysis death: Leigh infected Insulin into the Tubing connecting the victem To the dialysis machine. His syringe would not have been seen as a weapon.

Don

Figure 15. Letter from Don Cheney to Tom Voigt, 2002.

Note. From Zodiac Killer Ciphers (2019, January 9). This image is in the public domain.

speculated that Allen and Cheney could have been working together as a team in the Zodiac crimes. The documentary had a profound effect on the way the case is viewed and inspired one of these authors to write *Sighting In on the Zodiac Killer.* Research for this book involved learning as many things as possible about the people related to this case, and one thing stood out: Don Cheney's suspicious behavior in *His Name was Arthur Leigh Allen.* As a result of his" shifty" manner in the documentary, Don Cheney became a primary focus of the research for *Sighting In on the Zodiac Killer,* which addresses Cheney's potential involvement in the Zodiac crimes. The name of the book was based on what Don Cheney, who was an avid hunter and survivalist, called hunting: sighting in. It was also a play on the Zodiac killer's infamous cross-circle logo, which resembles a rifle scope sight.

The book lays out the basic facts of the case, establishes timelines for Cheney's claims against Allen, and examines the evidence for Don Cheney and Arthur Leigh Allen individually (and as a potential duo) taking part in the murders and in the letter-writing campaign. The book does not conclusively state that it was both men working in concert or that it was Cheney as a lone killer and letter writer. A careful, detailed analysis of this case indicates that Cheney was the sole attacker, with Allen and Cheney both having input into the Zodiac letters. This research has also led to a high amount of confidence that Cheney was the primary creator of the Zodiac persona and that Allen was a lower-level participant, possibly kept in the dark as far as the actual murders were concerned, and only taking part in the Zodiac letter-writing campaign.

HYPOTHESIS

Although Don Cheney and Arthur Leigh Allen were of similar age, were friends, and shared some interests, the differences in their social standing, apparent character, criminal background (or in Cheney's case, the lack thereof) make Arthur Leigh Allen better than Donald Lee Cheney as a match to the Zodiac killer; however, when comparing their known respective skillsets, likeness to the witness descriptions, and specific evidence for each, Don Cheney is a better match with the Zodiac killer than is Arthur Leigh Allen. Also, using the surprise principle, the expectation would be that the accuser, Cheney, would make a superior suspect based on descriptions of the killer and what has been ascertained about the killer's possible background and skills from his many written correspondences. Three

categories, which will be the salient data subset to which the surprise principle will be applied, will be featured.

ANALYSIS

This analysis will be using the surprise principle, which (as stated previously) tells us when facts strongly support one hypothesis over another by focusing on which of two competing hypotheses confers a greater probability on the data. There are two categories of data that strongly support the Cheney hypothesis over the Allen hypothesis, since the data are much more consistent with the Cheney hypothesis than the Allen hypothesis. The first category compares Allen and Cheney with witness descriptions of the Zodiac killer.

The first feature of the Zodiac killer descriptions that favors Cheney over Allen is the fact that the Zodiac was described as having hair. More specifically, the teenagers who saw the Zodiac killer in the Presidio Heights neighborhood of San Francisco described a man with a short crew-cut hairstyle. Officer Donald Fouke, who believes that he saw the Zodiac killer in the Presidio Heights neighborhood, said that the man he saw had a widow's peak, referencing a distinctive, V-shaped hairline that tends to be inherited (Prior, 2008).

As their photos show, Arthur Leigh Allen was almost completely bald by the time of the first Zodiac killer attack at Lake Herman Road in December 1968. Donald Cheney's hair more closely matches the descriptions of the Zodiac's hair than does Allen's. Cheney had a distinctive widow's peak and also had brown hair, matching the description of the hair that Bryan Hartnell saw coming through the eyelets of the killer's executioner's mask during the Lake Berryessa attack (Narlow, n.d.).

The teenage witnesses at Presidio Heights and Officer Don Fouke all said that the man they saw the night of the Paul Stine attack wore eyeglasses. Don Cheney was known to regularly wear eyeglasses until the early 1970s, while Arthur Leigh Allen was never known to wear eyeglasses. Both men were six feet tall. Don Cheney's weight was unknown in the late 1960s, but photographs of him from the mid-1960s and mid-1970s indicate that he was at least 25 to 30 pounds lighter than Allen. In addition, every eyewitness to the Zodiac killer said the person they saw was "stocky." Officer Fouke used the term "barrel-chested" (Narlow, n.d.). This was a better description of Don Cheney, who was noticeably stocky and barrel-chested in all his photos and in the documentary, His Name was Arthur Leigh Allen, than of Allen, who was not barrel-chested and at around 235 pounds, had a prominent stomach.

The second category considers the skills (from known profiles of the Zodiac killer, including those of Soren Korsgaard and Michael Cole) attributed to the Zodiac killer. These skills are sewing ability (based on the Zodiac's executioner's hood) and navigation skills (based on the Zodiac's drawing of the compass rose over Mt. Diablo). Many skillsets and specialized knowledge have been attributed to the Zodiac killer based on the crimes and the Zodiac letters and ciphers. Zodiac appears to have been a drafter and/or engineer because he evidently used an alignment grid (possibly graph paper) underneath the paper upon which he drew his ciphers, positioning both papers on a drafter's light table, the better to see the outline of the graph paper and make clean rows of cipher symbols. Note the image of the Zodiac's 340 Cipher. A light table (or engineer's table) is not something to which a layperson would generally have access (Cole, 2015) (See Figure 16).

As a mechanical engineer by trade, Don Cheney had manual drafting experience since computer software like AutoCAD was not yet in existence. Arthur Leigh Allen had no known drafting experience. So, here we have another

Figure 16. 340 Cipher.

Note. From Zodiac Killer Facts (n.d.). This image is in the public domain.

crucial fact that is more to be expected given the Cheney hypothesis than the Allen hypothesis.

The Zodiac killer most likely had more than a high school level of mathematical knowledge, or at least continued to use high school math into middle age. Cryptographers, including the Zodiac killer, use mathematics to hide data behind encryption. The Zodiac's 340 cipher was very complex. The 340 cipher had withstood over 50 years of attempts to break it until a group of three private citizens, including David Oranchak, a software developer in Virginia, Jarl Van Eycke, a Belgian computer programmer, and Sam Blake, an Australian mathematician, joined forces to break the code. Their solution was later confirmed as accurate by the FBI (Claburn, 2020). This is another important fact that is more expected with the Cheney hypothesis than with the Allen hypothesis.

Another skill connected to the Zodiac killer concerns sewing. Bryan Hartnell said that the hood that the Zodiac was wearing at Lake Berryessa was sewn together and that the logo on it also appeared to have been sewn with care (Prior, 2008). Don Cheney was highly skilled at making sewn leather items, such as leather sheaths for his hunting knives. Don Cheney even had a preference for high-carbon steel blades that he would sharpen himself for hunting trips. The autopsy report for Cecilia Shepard revealed that she was stabbed ten times with a very sharp knife with a foot-long blade. This is an additional fact that is more to be expected given the Cheney hypothesis than the Allen hypothesis.

One of the most compelling pieces of evidence for Arthur Leigh Allen is that he lived at the epicenter of Zodiac activity for the first and second canonical crimes. Allen's home at 32 Fresno Street in Vallejo was a short drive to both Lake Herman Road and Blue Rock Springs Park. During the Zodiac killer's phone calls to police immediately after both the Blue Rock Springs Park attack and the Lake Berryessa attack, Zodiac gave poor directions to each location, indicating that he had only a cursory knowledge of the area. Arthur Leigh Allen was a native of Vallejo and the general area; thus, he would have been able to give more precise directions to each crime scene. He was known to have gone skin diving at Lake Berryessa on several occasions (Arthur Lee Allen = Primed Suspect, n.d.; Zodiac Killer Facts, n.d.)

It should be noted here that Don Cheney moved to Southern California at some point after January 1969, just after the first canonical Zodiac attack at Lake Herman Road. Prior to relocating, Don Cheney lived in Concord, California, from 1968 to January 1969, where he would have had quick access to the Lake Herman Road site and have some knowledge of the location of Blue Rock Springs Park, the site of the second canonical Zodiac attack. Furthermore, it is known that some serial killers can sometimes target areas close to their previous residences, as explained in D. Kim Rossmo, Ph.D.'s *Geographic Profile: Zodiac Serial Murder,* which was submitted to the San Francisco Police Department for law enforcement use.

Although Don Cheney did not live in the target zone as identified by Kim Rossmo and furthermore had relocated to southern California after the first canonical Zodiac crime at Lake Herman Road, he had familiarity with the Zodiac crime locations because he had previously lived close to where the crimes had taken place. From early 1965 until sometime in late 1965 or early 1966, Don Cheney lived on Day Street in the Noe Valley neighborhood in the city of San Francisco. Living at this location would have given Cheney some familiarity with the North Bay Area in general and with the nearby Presidio Heights neighborhood, the location of the Paul Stine murder in October 1969.

From early 1966 until he moved to Southern California in January (estimated) 1969, Don Cheney lived in Concord, California, on Halifax Way Street. Living in Concord would have given Don Cheney a familiarity with Mt. Diablo, which is visible from any area in Concord. The Zodiac infamously made Mt. Diablo the centerpiece of a Phillips 66 road map that he mailed along with a letter to the San Francisco Chronicle in June 1970. The map showed a section of the Bay Area with the Zodiac's cross-circle logo drawn over Mt. Diablo (Zodiac Killer Facts, n.d.) (See Figure 17). The letter featured a short 32-character code that the Zodiac explained could be used along with the map to determine the location of the bomb, which he claimed to have buried. Don Cheney's residence in Concord had easy access to Interstate 680, which can be taken north to the Zodiac killer's first attack site of Lake Herman Road, which was only a 13-mile drive from Cheney's home. The Zodiac killer's second attack location, Blue Rock Springs Park, was only seven miles away from Lake Herman Road.

Applying these geographic profiling techniques, Michael Sudduth, Ph.D., professor of philosophy at San Francisco State University and friend, compiled a list of the dates of three of the four canonical Zodiac crimes and a list of dates that each Zodiac letter was mailed or hand-delivered in 1969, the year of the bulk of Zodiac activity.

This list was of major importance for the Cheney-as-the-Zodiac-killer hypothesis because Don Cheney (per his amended timeline) had moved to his wife's hometown of Pomona, California, in early 1969, prior to three of the canonical Zodiac crimes. As Pomona is a six-and-a-half-hour drive

Figure 17. Zodiac Killer's Phillips 66 Map.

Note. From Zodiac Killer Facts (n.d.). This image is in the public domain.

to the San Francisco Bay Area, it was vital that an analysis be done to show that it would have been possible for Cheney to have carried out the Zodiac crimes, given the round-trip travel time. Furthermore, the analysis done by Sudduth showed that it was possible for Cheney (or another suspect who lived far from the Bay Area) to have also mailed the San Francisco postmarked Zodiac killer letters.

He listed eight Zodiac events in 1969 with their corresponding date(s) as follows:

1. July 4th – Friday (Blue Rock Springs Park attack / Darlene Ferrin murder)
2. July 31st – Thursday (3 letters with 3 ciphers mailed)
3. August 4th – Monday – (letter) (may have been delivered August 3rd)
4. September 27th – Saturday (Lake Berryessa attack / Cecelia Shepherd murder)
5. October 11th – Saturday (Presidio Heights/Paul Stine murder)
6. October 13th – Monday (letter)
7. November 8th and 9th – Saturday and Sunday (letters)
8. December 20th – (letter)

Researching the exact date and day of each event allowed Sudduth to make three significant observations: The first was that apart from July 31, the remaining dates fell on a weekend or the beginning of the week. Even July 31 was part of a calendar week that runs into the weekend of August 2-3. Sudduth further noted that Zodiac letters that were postmarked on Monday could have been dropped off in a mailbox on Sunday, so the committing of murders and the delivery of the letters, at least in this block of time, are weekend actions. Secondly, it was found that four of the dates in the list of 1969 events were on or adjacent to a federal holiday: July 4 (Independence Day), October 13 (Columbus Day), November 11 (Veterans Day), and December 25 (Christmas Day). If the letter writer, presumably the

Zodiac killer, wanted to drive up to the Bay Area to deliver the letters, these dates would have been ideal for someone with a 9:00-to-5:00, Monday-to-Friday job, assuming they got these days off. Don Cheney was working a regular weekly job during this time period. The most significant observation made by compiling this data was that it would have taken only six trips to the Bay Area in a six-month period to accomplish the eight stated tasks.

As shown below, in examining the evidence for Arthur Leigh Allen, the surprise principle can be used to illustrate that the facts that appear to favor Allen are not as compelling as the facts that support the Cheney hypothesis.

Fact/Datum (D) Zodiac Killer characteristics	If Cheney were the Zodiac killer, then D would be	If Allen were the Zodiac killer, then D would be
Height: 6 feet tall	**Unsurprising**	**Unsurprising**
Weight: 200-215 lbs.	**Unsurprising**	**Unsurprising:** Allen weighed around 235 lbs., which is close to the eyewitness estimates.
Build: stocky and barrel-chested	**Unsurprising**	**Surprising:** He had a prominent stomach and was not barrel-chested.
Hair: brown/dark	**Unsurprising**	**Surprising:** Allen had blondish hair, and at the time of the murders, he was almost completely bald.
Age: 35-40 years old	**Unsurprising**	**Unsurprising**
Wore eyeglasses	**Unsurprising**	**Surprising**
Drafting/engineering ability	**Unsurprising**	**Surprising**
Higher math education	**Unsurprising**	**Surprising**
Sewing ability	**Unsurprising**	**Surprising**
Experience using firearms and knives	**Unsurprising**	**Unsurprising**
Familiar with the locations of the crimes	**Unsurprising:** Cheney had lived in the East Bay Area.	**Unsurprising:** Allen was a lifelong resident of Vallejo, the epicenter of the crimes.
Experience in celestial navigation	**Unsurprising**	**Surprising**

Of the 12 salient data points, none of them are surprising under the Cheney hypothesis, but seven are surprising under the Allen hypothesis, so the total set of evidence supports the Cheney hypothesis more than it does the Allen hypothesis.

Listed below are the strongest pieces of evidence in favor of Allen's being the Zodiac – the characteristics of Allen that most closely match those of the Zodiac killer.

1. He owned and frequently wore a Zodiac wristwatch that had the name "Zodiac" combined with the cross-circle logo employed by the Zodiac killer.
2. He was known to misspell words for comedic effect, like the Zodiac killer did in his various correspondences.
3. Allen's close friend Phil Tucker said that Allen claimed to like the book *The Most Dangerous Game,* a book which was referenced in the decoded Zodiac killer 408 Cipher (Bawart, n.d.) (Grinell, The 408 Code is Cracked, n.d.)

Comparing these pieces of evidence with Don Cheney produces a surprising result.

1. Don Cheney was an avid hunter of large game.
2. Don Cheney's paternal grandfather had a first cousin named Mary Ingersoll Paradice. Paradice was a word often used by the Zodiac killer, as in his statement in what is known as the Little List Letter, "If you do not wear any type of buttons, I shall (on top of everything else) torture all 13 of my slaves that I have waiting for me in Paradice" (Grinell, The Litte List Letter, n.d.). It is a surprise to find this uncommon surname with an unusual spelling connected to the man who brought forward the prime suspect in the case.
3. Don Cheney attended Bakersfield Junior College from the Fall of 1952 until the Spring of 1954. Paul Avery, a San Francisco Chronicle newspaper crime reporter, who made a name for himself by writing about the Zodiac killer at the time of his crimes and even received a threatening letter from the Zodiac, also attended Bakersfield Junior College from the Fall of 1952 until the Spring of 1953. Cheney and Avery's freshman class consisted of approximately three hundred students. Avery ran for class president in 1952, wrote for the school newspaper, and was the Director of Student Assemblies during his tenure at Bakersfield Junior College. It is a surprise that two figures central to the Zodiac case were in such close proximity sixteen years prior to the first canonical Zodiac killer attack and almost three hundred miles away from the Bay Area.

CONCLUSION

By applying the surprise vs. no surprise principle and exercising a comparative and contrastive analysis of the

physical features, skillsets (attributes), and evidence between Don Cheney and Arthur Leigh Allen, Don Cheney is the superior suspect by comparison. It should be noted that the evidence for Arthur Leigh Allen can simply transfer to someone who knew him and wanted to implicate him in the crime.

Therefore, we submit the three most important items that favor a Cheney-alone hypothesis vs. an Arthur Leigh Allen-alone hypothesis.

1. As a mechanical engineer and drafter, Don Cheney would have been more capable of constructing the Zodiac ciphers and the bus bomb diagram than Allen, who was not known to have had a mathematical/engineering aptitude or background. This is to be expected if Cheney is the Zodiac killer – that the Zodiac would have engineering and drafting skills (See Figure 18).
2. Cheney matched the witnesses' physical descriptions of the killer (stocky, barrel-chested, and brown-haired with a widow's peak) better than did Allen, who was obese and bald. If Cheney were the Zodiac killer, it would be expected that the Zodiac would have Cheney's physical features.
3. Cheney had the following characteristics, which Allen did not: (1) the Paul Avery/ Bakersfield Junior College connection, (2) a relative named Paradice, (3) extensive big-game hunting experience, (4) a high proficiency with knives, (5) great skill as a seamster, and (6) handwriting that appears to be similar to that of the writer of the Zodiac letters. If Cheney were the Zodiac killer, it would be no surprise that the Zodiac had the characteristics listed above.

Although a careful analysis shows that Don Cheney makes a better Zodiac killer suspect than does Allen relative to the evidence here considered, this case remains unsolved. The characteristics analyzed in this examination

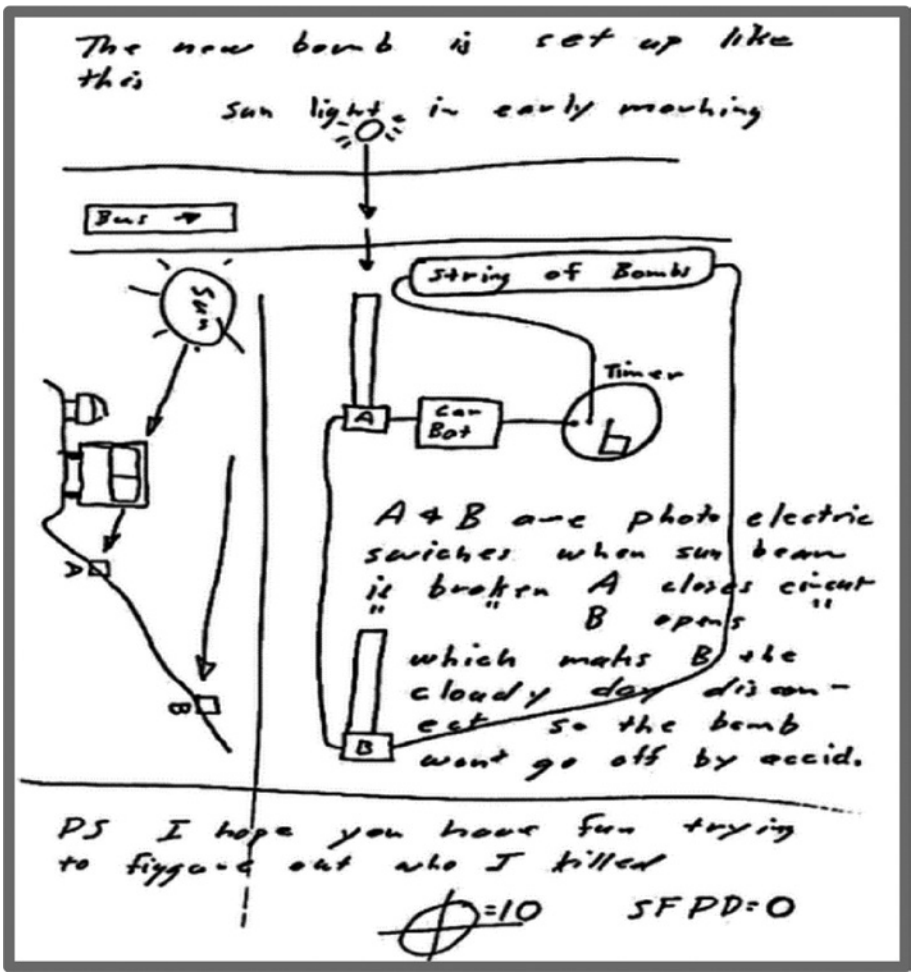


Figure 18. Zodiac's Bus-Bomb Diagram.

Note. From Grinnell (n.d.). This image is in the public domain.

are pertinent to the Zodiac investigation, but this analysis does not offer conclusive proof of the Zodiac's identity. The technique, as utilized by laboratories such as Othram, Inc., of using new DNA technologies to amplify small and degraded DNA samples enough to make them usable for testing and then comparing these test results to genetic genealogy data to identify potential suspects, is making long cold cases now solvable. Of course, DNA evidence is circumstantial evidence, and even if a person of interest were identified through DNA testing of the Zodiac letters, that individual would still not be placed at any of the crime scenes.

Unfortunately, the case may never be solved unless some physical evidence, such as the killer's hood or one of his guns, turns up somehow and can be tied to an individual who was in or around the Bay Area in the late 1960s. The adage that the Zodiac killer case gets solved three times a year remains true. In May of 2023, a volunteer group called The Case Breakers (2021; n.d.), led by Thomas Colbert, a former media executive and current media consultant, sent out a press release, claiming that they had connected a man named Gary Francis Poste to the Zodiac case. They further claimed that "the felon has been secretly listed as the Zodiac suspect in Headquarters' computers since 2016 – with his partial DNA safely secured at the feds' Quantico, Virginia lab." (Griffin, 2023) The team also claimed that one of its members was told by an FBI whistleblower that the FBI has a partial sample of Poste's DNA in their database, but has failed to use it to identify Poste as the Zodiac.

The Case Breakers describe themselves as a forty-plus-member team of former law enforcement investigators. The team first made headlines in 2016 with a press conference announcing that the team had identified a former Vietnam veteran, Robert Rackstraw, as the infamous hijacker D.B. Cooper (Time-Line: How Sleuths Exposed D.B. Cooper and his FBI Cover-Up, 2021). This identification by the team led to a book called *The Last Master Outlaw* by Colbert and to a History Channel show, called *D.B. Cooper: Case Closed,* that aired in 2016. The show culminated in a scene during which Tina Mucklow, the flight attendant who had spent the most time with D.B. Cooper, looked at a table of photographs of Rackstraw and quickly concluded that he was not the hijacker ("D.B. Cooper: Case Closed?," 2016). Serious true crime researchers find it unfortunate that people with media contacts, like Thomas Colbert, without doing serious due diligence on the cases or on the various suspects they put forward, are able to get misleading headlines on websites like *Fox News* and the *Daily Mail.* The media outlets that accept these stories should have journalistic integrity and check the veracity of these stories instead of creating misleading headlines.

Gary Poste was originally submitted as a suspect by the group in 2021, with their best piece of evidence being the fact that Poste had scars on his forehead that were similar to the "scars" shown in the Zodiac killer sketch (Sheets, 2021). Unfortunately for The Case Breakers, the lines shown on the forehead of the Zodiac sketch were age lines, not scars. Although The Case Breakers appear to have a direct line to big media outlets, their claims do not meet the Carl Sagan Standard that extraordinary claims require extraordinary evidence. The Case Breakers have also claimed that they will reveal the final fate of Teamster leader Jimmy Hoffa in the future (The Case Breakers, n.d.). Bold claims such as these have become the new normal for the Zodiac case, as it has only grown in popularity and has remained unsolved for over fifty years.

REFERENCES

Arthur Lee Allen = Primed suspect. (n.d.). *Zodiac Killer Facts.* https://zodiackillerfacts.com/allen.htm

Associated Press. (2018, May 3). DNA match sought to Zodiac killer after break in other case. *The Florida Times-Union.* https://www.jacksonville.com/story/news/2018/05/04/dna-match-sought-to-zodiac-killer-after-break-in-other-case/12317196007/

Bawart, G. (n.d.). *The Bawart report.* https://www.zodiackiller.com/Bawart1.html

Beeson, D. (2019). *Sighting in on the Zodiac Killer.* Fort Necessity Press.

Betty Lou Jensen. (2018, December 20). *Zodiac Killer Facts.* https://zodiackillerfacts.com/tag/betty-lou-jensen/

Blue Rock Springs Park: July 4, 1969. (n.d.). *Zodiac Killer Facts.* https://zodiackillerfacts.com/the-crimes/7-4-69-blue-rock-springs-park-vallejo-california/

Bryan Hartnell. (2016, September 27). *Zodiac Killer Facts.* https://zodiackillerfacts.com/tag/bryan-hartnell/

The Case Breakers. (2021). Time-line: How sleuths exposed D.B. Cooper and his FBI cover-up. *The Case Breakers.* https://thecasebreakers.org/d-b-cooper-and-his-fbi-cover-up/

The Case Breakers. (n.d.). *The Last Hoffa dig.* https://thecasebreakers.org/2021/01/the-last-hoffa-dig/

Claburn, T. (2020, December 12). FBI confirms Zodiac Killer's 340 cipher solved by trio of amateur math and software codebreakers. *The Register.* https://www.theregister.com/2020/12/12/zodiac_killers_cipher_solved/

Cole, M. (2015, September 15). The story of Paul Stine. *Zodiac Revisited.* https://zodiacrevisited.com/the-story-of-paul-stine/

D.B. Cooper: Case closed? (2016). [Motion picture]. https://thecasebreakers.org/d-b-cooper-and-his-fbi-cover-up/

Derbeken, J. V. (2002, May 19). SFPD dead last in solving violent crime: How analysis of data made case for story. *SFGATE.* https://www.sfgate.com/crime/article/SFPD-DEAD-LAST-IN-SOLVING-VIOLENT-CRIME-How-3308792.php

Ellerbrok, K. H. (2011, December). The social study of serial killers. *Centre for Crime and Justice Studies.* https://www.crimeandjustice.org.uk/publications/cjm/article/social-study-serial-killers#:~:text=Serial%20killing%20is%20the%20rarest,off'%20period%20between%20each%20murder

Fagan, K. (2018, May 4). Zodiac Killer case: DNA may offer hope of solving the mystery. *San Francisco Chronicle.* https://www.sfchronicle.com/crime/article/zodiac-murder-case-police-taking-another-look-at-12885070.php

Find a Grave. (n.d.). Donald Lee "Don" Cheney. *Find a Grave.* https://www.findagrave.com/memorial/174690403/donald_lee-cheney

Frederick, M., & Lindsey, P. (Hosts). (2019, January 15). Monster: The Zodiac killer – Taxi driver [Audio podcast episode]. In *Monster: The Zodiac Killer.* iHeart. https://www.iheart.com/podcast/105-monster-the-zodiac-killer-48359856/episode/taxi-driver-05-48359867/

Griffin, A. (2023, May 18). Volunteer group claims FBI failed to investigate Zodiac killer 'suspect' Gary Francis Poste. *New York Post.* https://nypost.com/2023/05/18/fbi-failed-to-investigate-zodiac-killer-suspect-group-claims/

Grinell, R. (n.d.-a). *Bus bomb letter.* Zodiac Ciphers. https://www.zodiacciphers.com/bus-bomb-letter.html

Grinell, R. (n.d.-b). *The 408 code is cracked.* Zodiac Ciphers. https://www.zodiacciphers.com/complete-408-cipher.html

Grinell, R. (n.d.-c). *The little list letter.* Zodiac Ciphers. https://www.zodiacciphers.com/the-little-list-letter.html

Grinell, R. (n.d.-d). *The red phantom letter.* Zodiac Ciphers. https://www.zodiacciphers.com/red-phantom-letter-american-greetings-card.html

Lake Berryessa – September 27, 1969. (n.d.). *Zodiac Killer Facts.* https://zodiackillerfacts.com/lakeberryessa.htm

Lake Herman Road: December 20, 1968. (n.d.). *Zodiac Killer Facts.* https://zodiackillerfacts.com/the-crimes/12-20-68-lake-herman-road-benicia-california/

Narlow, K. (n.d.). Gallery – Narlow report. *Zodiac Killer Facts.* https://zodiackillerfacts.com/gallery/displayimage.php?pid=251&fullsize=1

Paul Stine. (n.d.). *Zodiac Killer Facts.* https://zodiackillerfacts.com/?s=paul+stine

Prior, D. (Director). (2008). *His name was Arthur Leigh Allen* [Motion picture].

Prior, D. (Director). (2008). *This is the Zodiac speaking* [Motion picture].

Roback, J. (2023, July 13). Disturbing claims: Is the Zodiac killer real or was there more than one? *The U.S. Sun.* https://www.the-sun.com/news/8591591/zodiac-killer-real-myth/

Rossmo, D. K. (1999). *Geographic profiling* (1st ed.). Routledge.

Russo, C. (2018, December 20). Why has DNA evidence not yet unmasked the Zodiac killer? *Medium.* https://medium.com/@charlierusso23/why-has-dna-evidence-not-yet-unmasked-the-zodiac-killer-26ed5cac40f3

Sheets, L. K. (2021, October 7). Zodiac killer case breakers 'matched Gary Poste's scars to killer's forehead' on police sketch to crack murder mystery. *The U.S. Sun.* https://www.the-sun.com/news/3809978/zodiac-killer-identified-scars-head-case-cracked/

Sober, E. (2021). *Core questions in philosophy* (8th ed.). Routledge.

The True Crime Database. (n.d.). *This is the Zodiac speaking.* The True Crime Database. https://www.thetruecrimedatabase.com/case_file/zodiac-killer/

340 cipher. (n.d.). *Zodiac Killer Facts.* https://www.zodiackiller.com/340Cipher.html

Wark, J. (n.d.). The Zodiac Killer fingerprint evidence. *Crime Library.* https://www.crimelibrary.org/serial_killers/notorious/zodiac/evidence_11.html#:~:text=Often%2C%20the%20Zodiac's%20claim%20in,conclusive%20evidence%20against%20a%20suspect

Zodiac DNA questions. (n.d.). *Zodiac Killer Facts.* https://zodiackillerfacts.com/zodiac-unsub/unsub-the-evidence/zodiac-dna/zodiac-dna-questions/#:~:text=The%20partial%20genetic%20profile%20could,the%20back%20of%20the%20stamp

Zodiac killer facts image gallery. (n.d.-a). *Zodiac Killer Facts.* https://zodiackillerfacts.com/gallery/displayimage.php?album=4&pid=125#top_display_media

Zodiac killer facts image gallery. (n.d.-b). *Zodiac Killer Facts.* https://zodiackillerfacts.com/gallery/displayimage.php?album=5&pid=163#top_display_media

The Zodiac's Mt. Diablo clues. (n.d.). *Zodiac Killer Facts.* https://zodiackillerfacts.com/The%20Mt.%20Diablo%20Map.htm

Zodiac: School teacher? (n.d.). *Zodiac Killer.* https://zodiackiller.com/AllenSchool.htm

Journal of Scientific Exploration
Anomalistics and Frontier Science

RESEARCH ARTICLE

Strategies for Teaching Critical Thinking about Replication Based on A Study of Introductory Psychology Textbooks

Jeffrey S. Reber
University of West Georgia
jreber@westga.edu
orcid.org/0000-0002-3528-124X

Debra L. Katz
California institute of Human Sciences

Jacob H. Tengelsen
Northwest Missouri State University

Peder Schillemat
University of West Georgia

SUBMITTED July 6, 2024
ACCEPTED August 22, 2024
PUBLISHED October 15, 2025

https://doi.org/10.31275/20253485

ABSTRACT

Background: The replication crisis highlights the importance of teaching students scientific and critical thinking. Replication relevant content in the Introduction to Psychology textbook (IPT) can be a valuable resource to instructors interested in this skillset.
Objective: To suggest strategies instructors could use to teach scientific and critical thinking based on an examination of replication relevant content in IPTs.
Method: Researchers and raters analyzed the treatment of replication and the replication crisis in 12 popular IPTs. They also analyzed authors' descriptions of 30 highly cited replicable studies.
Results: Results showed that 11 of the IPTs discussed replication, and half addressed the replication crisis. IPT authors rarely mentioned the replication status of studies they reviewed, but they often used language indicating greater confidence in the validity and reliability of the results, indiscriminate of that status.
Conclusion: The treatment of replication in IPTs provides a launching point from which to engage students in activities and tasks that can help them appreciate and think critically about this important pillar of science.
Teaching Implications: Scientific and critical thinking can be developed by instructors who use the IPT to educate students about replication, the replication crisis, and the replication status of studies.

KEYWORDS

replication, replication crisis, critical thinking, introduction to psychology.

STRATEGIES FOR TEACHING CRITICAL THINKING ABOUT REPLICATION BASED ON INTRODUCTORY PSYCHOLOGY TEXTBOOKS

More than just addressing topics in anomalistics, this *Journal* has regularly published papers about important methodological and analytical issues within broader academia and science (Dobyns et al, 2004; Gernert, 2010; Katz, 2022; Scargle, 2000; Sheldrake, 1998; Sturrock, 1994). This paper follows this tradition by focusing on the topic of replication, which is often touted as the cornerstone of scientific integrity and progress (e.g., National Academies of Sciences, Engineering, Medicine, 2019; Holden & Goodwin; 2018) though its exact definition and relevance are hotly debated (Feest, 2019; Iso-Ahola, 2020; Nosek & Errington, 2020). Indeed, not all questions or phenomena readily lend themselves to repeated observations or testing (see e.g., Stevenson, 1999). Nevertheless, replications generally involve the process of conducting successive studies, following the same or improved methods, to verify the results obtained in prior research. This practice is

especially important for controversial studies or maverick theories due to the following reasons:

1. **Confirmation of Findings:** Controversial studies often challenge established knowledge or present surprising results. Replication is necessary to confirm these findings and ensure they are not outliers or the result of methodological errors. Without replication, it is difficult to discern whether the original results are reliable.
2. **Reducing Bias and Error:** Controversial topics can be subject to heightened scrutiny and skepticism, which increases the likelihood of bias, both in favor of and against the findings. Replication helps identify and mitigate these biases, ensuring that the results are not influenced by individual researchers' expectations or methodological flaws.
3. **Building Consensus:** Scientific consensus is not achieved through a single study but through a body of evidence that consistently supports a particular finding. In controversial areas, replication is crucial for building this consensus, as repeated confirmation of results helps to establish a shared understanding and acceptance within the scientific community.
4. **Informing Policy and Public Opinion:** Controversial studies often have significant implications for public policy, health, and societal norms. Reliable, replicated results are essential for informing policy decisions and guiding public opinion. Without replication, policies based on controversial findings may be misguided or harmful.
5. **Enhancing Credibility:** Controversial findings are often met with skepticism. Replication by independent researchers enhances the credibility of these findings, demonstrating that they are not the result of a single laboratory's methods or biases but are generalizable and robust.
6. **Encouraging Scientific Rigor:** Knowing that controversial findings will be subject to replication encourages researchers to use the most rigorous methods possible. This helps to ensure that the initial study is conducted with high standards, reducing the likelihood of errors and increasing the reliability of the findings.
7. **Clarifying Ambiguities:** Controversial studies may produce ambiguous or mixed results. Replication helps clarify these ambiguities by providing additional data points and perspectives. This can lead to a better understanding of the conditions under which the findings hold true or fail.
8. **Public Trust in Science:** Public confidence in scientific research hinges on its reliability and honesty. Replication builds trust by demonstrating that scientific findings are not just isolated incidents but are reproducible and reliable truths. In an era where misinformation can spread rapidly, demonstrating the replicability of scientific studies is crucial for maintaining public trust.

A number of these reasons were tested following a 2011 publication by social psychologist Daryl Bem that presented controversial findings from a series of experiments that demonstrated the retroactive influence of future events on current behaviors. Bem's article prompted several attempts to directly replicate the results of his studies (see Korbmacher et al., 2023). To encourage such replications, Bem offered "free, comprehensive packages that included detailed instruction manuals for conducting the experiments, computer software for running the experimental sessions, and database programs for collecting and analyzing the data" (Bem et al, 2016, p. 1). Within a period of two years, Bem and colleagues gathered the results of 90 experiments from 33 different laboratories located in 14 different countries. They conducted a meta-analysis on those results that confirmed Bem's earlier findings, noting that "A Bayesian analysis yielded a Bayes Factor of 5.1×10^9, greatly exceeding the criterion value of 100 for 'decisive evidence' in support of the experimental hypothesis." (Bem et al, 2016, p. 1).

Other researchers' efforts to reproduce Bem's findings, however, proved to be as anomalous as were the retro-causal effects he was studying. Indeed, a large number of attempts to reproduce Bem's results, along with the results of many other controversial studies, consistently failed to repeat the findings of the original studies in just from as many as one-third (e.g., Camerer et al., 2018) to one-half of the attempts (e.g., Open Science Collaboration, 2015). These replication failures occurred even when large sample sizes were used. As researchers looked deeper into these replication failures, they identified trends of "underpowered studies, publication bias, imprecise theories, and inadequate statistical procedures" (Lewandowsky & Oberauer, 2020, p. 1). Wiggins and Christopherson (2019) also note that, "the widespread use of so-called questionable research practices . . . likely dramatically inflate[d] the false positive rate in the psychological literature" (p. 204).

Though not intended, Bem's 2011 study of an anomalous phenomenon initiated what is now widely known as the replication crisis in psychology (Lewandowsky & Oberauer, 2020; Youyou et al., 2023), a crisis that has proven to be critical to psychology's status and development as a scientific discipline. This crisis demonstrates the importance of close adherence to the key principles and practices of empirical research in designing and carrying out original research and conducting and publishing replications. It also shows how psychologists have practiced scientific and critical thinking to uncover issues in psychological research studies that have made replication difficult to achieve and/or to publish, including issues attending the fit of the empirical method and replication to psychological phenomena that may not readily or easily lend themselves to such approaches. This critical thinking has resulted in a number of important positive reforms in replication research (Korbmacher et al., 2023; Shrout & Rodgers, 2018). Ultimately, the replication crisis, rather than dealing a fatal blow to the discipline, demonstrates how scientific and critical thinking can course correct a discipline and improve its knowledge advancement.

This course correction certainly happens in the psychology lab and in the editorial offices of academic journals and textbooks, but it can also take place in the psychology classroom, including, perhaps most importantly, in the Introduction to Psychology classroom. Few students who enter this course would have a comprehensive understanding of the replication crisis in psychology, especially its fascinating origin story in anomalistic research. Fewer still would appreciate the reasons cited above for valuing replication in the context of controversial findings and would likely not be capable of applying scientific and critical thinking skills to such findings. These students need instruction and guidance in the principles of replication in order to understand its importance to psychology generally, but also to know how to think carefully and critically about surprising and controversial results, like those often found in anomalistic studies. The purpose of this article is to suggest several strategies that Introduction to Psychology course instructors can implement to teach students to think scientifically and critically about replication that build upon the treatment of replication and the replication crisis in Introduction to Psychology textbooks (IPT).

THE INTRODUCTION TO PSYCHOLOGY TEXTBOOK

In 2016, a working group of educators under the direction of the American Psychological Association's Board of Educational Affairs highlighted the popularity and importance of the Introductory Psychology course (Gurung et al., 2016), falling just behind English Composition, with somewhere between 1.2 and 1.6 million students enrolling in the course each year. The group noted that for many of these students, this course will likely be "their only formal exposure to psychological science" (p. 112), making it "psychology's most influential course" (p. 113). The most common feature of the introductory psychology course is the IPT, with as many as 98% of introductory classes requiring an IPT (Miller & Gentile, 1998). The 2016 working group observed that the curriculum of the introductory course tends to closely follow IPT content and instructors rarely assign materials, or cover topics, beyond the textbook. Generally, they also lecture on topics in proportion to the amount of coverage the topics receive in these books (Gurung et al., 2016). Thus, IPT content plays a significant role in the course curriculum and students' perceptions and understanding of psychological science. Collisson et al. (2015) found that even the number of citations in an IPT can influence student perceptions, noting that "psychology was perceived as less scientific, and its findings less agreed upon when [IPTs] contained fewer citations" (p. 6). This suggests that students are attentive to psychology's status as a science, and the content of the IPT, including studies cited and described in the IPT, can enhance or detract from that status.

The IPT is also an important tool for teaching students the core competencies of scientific and critical thinking. This skillset has been identified by many psychologists as essential for students taking psychology courses (e.g., Stanovich, 2007; Sternberg & Halpern, 2020). McBurney (1996) asserts that the chief purpose of psychology courses is to teach students "to apply the same critical thinking skills to human behavior that scientists do" (pp. vii-viii). Many IPT authors have built critical thinking activities and tasks into their textbooks, and a number of psychologists have written critical thinking handbooks to supplement the critical thinking content in IPTs (e.g., Ruscio, 2006; Slife et al., 2005; Sternberg & Halpern, 2020). The APA's Introductory Psychology Initiative (2023) has also included scientific inquiry and critical thinking as one of its key goals for student development. The IPT, then, plays an essential role in educating students not only about the content of psychology but also in educating students about how psychologists use scientific methods and critical thinking skills to investigate that content.

REPLICATION AND THE IPT

Replication is an important feature of scientific and critical thinking for psychology and other sciences (Fidler

& Wilcox, 2021; Schmidt, 2009). A recent editorial (*Nature*, 2021) reminds journal readers of replication's foundational role in science, noting that "the entire scientific community must recognize that replication is not for replication's sake, but to gain an assurance central to the progress of science: that an observation or result is sturdy enough to spur future work" (para. 13). Despite its importance, research by Anglin and Edlund (2019) found that psychology course instructors tend to discuss replication in their courses only briefly, if at all, and this is particularly true in the Introduction to Psychology course. This is likely a consequence of the limited amount of textbook space and classroom time that instructors can dedicate to any topic in a content-heavy survey course. Anglin and Edlund support this conclusion, finding that instructors of content courses spent less time on replication and related topics than instructors of research methods and statistics courses. As a corrective measure, they suggest that instructors consider replication less a topic of content and more a tool for developing students' "critical scientific thinking skills" (p. 72). The replication crisis is particularly apropos of this purpose and could be used as a case study along with other replication-relevant IPT content to help Introduction to Psychology instructors teach this important skillset.

To that end, knowing the typical treatment of replication in introductory textbooks would be helpful. A few relevant preliminary inquiries can be found. Schmidt (2009), for example, looked at the treatment of replication across a variety of disciplinary materials, including textbooks. He concluded that despite the importance and value placed on replication, it is infrequently addressed in the literature. More recently, Griggs and Whitehead (2014, 2015) reviewed Introductory Social Psychology textbooks and found that the replication status of some famous social psychological studies (e.g., Milgram's obedience study) was noted, but the textbook authors did not discuss methodological issues that impacted the replicability of these studies. Diener and Biswas-Diener (2024) suggest that replication issues with these famous studies, as well as with many lesser-known studies, may also be omitted or misrepresented in IPTs.

These findings, though suggestive, provide little substantial information about the treatment of replication and the replication crisis in IPTs. This study is designed to provide Introduction to Psychology course instructors a better understanding of the general treatment of replication and the replication crisis in and across commonly used IPTs, so instructors can build lesson plans and activities based on that IPT content that will help their students practice and develop their scientific and critical thinking competencies. Three research questions guided the investigation. First, do IPT authors discuss replication, and if so, how do they typically teach it? Second, do IPT authors bring up the replication crisis, and if so, what do they generally say about it? Finally, when IPT authors describe replicable studies, do they note the replication status of the studies, and do they use language that expresses greater or lesser confidence in the validity and reliability of the findings according to the replication status of the studies? The answers to these questions, depending on their consistency, might suggest a number of specific strategies that instructors could take to teach replication and promote scientific and critical thinking.

METHODS

Textbook Selection And Data Preparation

Researchers first compiled a comprehensive and representative list of the most often used IPTs using published reports of top-selling books, following a precedented procedure (see Chandler, 2019; Warne et al., 2018). Selected texts were included in lists of the top 30 IPTs for both Amazon and Google. To be included, IPTs were published between 2017 and 2018. There are two reasons for our focus on these dates. First, we initiated this research in 2018, a time when the replication crisis was receiving a lot of public attention and psychology textbooks would likely be most sensitive to replication and the issues attending it. As a check on the current popularity of the selected IPTs, we reviewed the best-selling lists again in 2024 and reconfirmed that these editions remain among the top-selling IPTs on Amazon and Google. The second reason for limiting the inclusion of IPT editions to the same two years is that we wanted to maintain a consistency of comparison across textbooks. This is also the reason why open-source textbooks were excluded. We wanted a sample that was homogeneous with regard to time of publication and format. A final criterion for inclusion was that the IPTs had to be available via eBook or as searchable online versions. Researchers queried publishers as to the availability of electronic, searchable copies of the textbooks. Table 1 lists the 12 IPTs that appeared most often at the top of these reports and were made available to researchers by textbook publishers.

Table 1. Twelve Top Selling IPTs.

Author(s)	Year	Trials	Hits	Hits %
Ciccarelli & White	2017	Psychology: An Exploration	5th	Pearson
Coon et al.	2018	Introduction to Psychology: Gateways to Mind and Behavior	15th	Cengage Learning.
Feldman	2018	Understanding Psychology	14th	McGraw-Hill Education.
Griggs	2017	Psychology: A Concise Introduction	5th	Worth Publishers
Hockenbury & Nolan	2018	Psychology	8th	Worth Publishers
Kalat	2017	Introduction to Psychology.	11th	Cengage Learning
Lilienfeld et al.	2017	Psychology: From Inquiry to Understanding	4th	Pearson
Myers & DeWall	2018	Exploring Psychology in Modules	11th	Worth Publishers
Rathus et al.	2017	Psych: Introduction to Psychology.	3rd	Cengage Learning
Schacter et al.	2018	Psychology	4th	Worth Publishers
Wade et al.	2017	Invitation to Psychology	7th	Pearson
Weiten	2017	Psychology: Themes and Variations	10th	Cengage Learning

Criteria for the selection of articles to evaluate in and across the textbooks included that they had to have been cited in at least 3 of the 12 IPTs, and they had to be studies that had the potential to be replicated, thus eliminating historical, biographical, or theoretical articles. To assess the author's treatment of replication, researchers conducted a search of the body of each IPT using the term "replication" and any of its roots and derivatives to identify where replication was mentioned by the author. A similar search was conducted using the combination of the terms "replication" and "crisis" and their synonyms. Passages that contained these words were copied and pasted into a spreadsheet.

Treatment of Replication, The Replication Crisis, and Replication Status

Researchers conducted a content analysis of all IPT excerpts addressing replication and the replication crisis. The analysis included examining how much attention was generally dedicated to these topics by IPT authors and discerning any common and differing themes that emerged from the texts. To examine the replication status of studies cited in IPTs, a sample of 1/3 of the articles that were original replicable studies and were referenced in at least 3 of the 12 textbooks was randomly selected for analysis. To ascertain any impact of replication status on the IPT authors' descriptions of the studies, researchers first determined whether the replicable studies had been directly or conceptually replicated. Direct replications repeat the protocols of the original study but with a different sample. Conceptual replications use a different methodology to test the same hypothesis as the original study (see Nosek & Errington, 2017).

Researchers determined whether the sample of studies had been directly or conceptually replicated using Google Scholar (see Zientek et al., 2018). After locating each sampled study in Google Scholar, researchers selected the option to view all available published articles, dissertations, and theses that cited the study. This provided a list of hundreds and, in some cases, thousands of sources. Researchers then used Google Scholar's advanced search to examine the text of each source to see if it clearly qualified or disqualified as being either a direct or conceptual replication. As a matter of quality control, the sample articles were divided evenly among researchers for examination, with six of the articles assigned to more than one examiner to ensure the consistency of results.

Descriptions of Replicable Studies

Researchers recruited two psychology graduate students, one in the PhD program and one in the MA program at UWG, who volunteered to serve as raters. The raters were blind to the purposes of the research. They only knew that they would be examining textbook excerpts in which the authors described psychological research. Two researchers conducted a training session with the raters in which they walked them through sample excerpts and showed them how to identify and distinguish between explicit, implied, and non-reported references to the replication status of the studies following previously documented coding protocols (e.g., Makel et al., 2012). An example of an explicit mention that was used to train the raters was taken from the Rathus et al. (2017) IPT, which reads, "The Schachter

and Singer study has been replicated, but with different results…" (p. 225). An example excerpt that was used to train raters on identifying implied references to replication was taken from Myers and DeWall's (2018) IPT, who, after describing a study by Savic et al. (2005), wrote that "Other studies of brain responses to sex-related sweat odors and to pictures of male and female faces have found similar gay-straight differences" (p. 412).

Raters were also trained to examine the extent to which IPT authors used language in their descriptions of the studies that indicated strong confidence in the reliability and validity of the study findings. Recall that successful replications increase confidence in the knowledge gained from a study, whereas the knowledge gained from unreplicated studies is more tentative (National Academies of Sciences, Engineering, and Medicine, 2019). Statements that generalize findings beyond the sample and use more factual verbs, like "these findings show that people are. . ." indicate strong confidence in the veracity of the findings, whereas a phrase signifying weaker confidence would avoid inferences to the population and use tentative verbs, like "these findings suggest that some people who are like participants in this study's sample, may. . .". One IPT excerpt used in training raters that illustrates confident language reviews the results of an oft-cited study of short-term memory (Peterson & Peterson, 1959), after which the IPT authors (Wade et al., 2017) conclude that "when people are prevented from rehearsing, the contents of their working memories quickly fade" (p. 239). An illustration of less confident language is used by Schacter et al. (2018) in citing the results of the same study. They draw the more reserved conclusion that "these results suggest that information can be held in the short-term memory store for about 15 to 20 seconds" (p. 222).

Raters practiced examining IPT excerpts for explicit mentions of replication, implied mentions, or no mention of replication, as well as indications of direct and/or conceptual replications in the study description, and language connoting strong confidence in the reliability and validity of the findings, until they achieved consistent assessments, with little variation, across multiple examples. Following their training, raters were provided with access to a Google form that presented each excerpt, followed by questions that asked for the raters to indicate if the study description made explicit reference, implied reference, or no reference to replication, whether the reference, if present, implicated direct, conceptual replication, or both, and whether the language used in describing the study indicated strong confidence in the validity and reliability of the study findings. Each rater independently and anonymously evaluated each excerpt.

Excerpts were assigned to raters in a fully crossed design, allowing for systematic rater bias to be identified and controlled. As the data was nominal, Cohen's Kappa was selected as the IRR measure. Following McHugh (2012), only Kappas at .60 and above would be considered adequate to place confidence in rater agreement. If Kappas met this cutoff for each measure, discrepancies between raters would be resolved by researchers who would identify systematic bias (i.e., patterns of ratings that were inconsistent with training) and then confirm the presence of the bias with the relevant rater. Any scores from a single rater identified and confirmed as biased would be excluded from further analysis. If both raters' scores on an excerpt were inconsistent with training, then they would rescore the excerpt following retraining by the researchers.

RESULTS

Mentions of Replication

Researchers found that in 11 of the 12 IPTs, replication was usually discussed in a section of the first chapter that reviewed the scientific method. On average, IPT authors wrote approximately three paragraphs on the topic of replication, but that quantity ranged somewhat widely. One IPT (Coon et al., 2022) mentioned replication only one time in the entire text in one reference to a cited study. Another IPT (Kalat, 2017) discussed replication in detail in a two-page section. In reviewing replication, almost all the authors describe its basic assumptions, how it is conducted directly and conceptually, and how it strengthens confidence in the original study findings. Statements about replication like this one from Lilienfeld et al. (2017) were common: "Replicability means that a study's findings can be duplicated consistently. Replication is the cornerstone of a dependable science" (p.26). Ciccarelli and White's (2017) treatment of replication was also representative of most IPT authors: "If others can replicate your research (meaning, do exactly the same study over again and get the same results), it gives much more support to your findings" (p. 20). Hockenbury and Nolan (2018) reflect a common concern expressed by IPT authors about studies that have not been successfully replicated, stating, "If the replication of a study fails to produce the same basic findings, confidence in the original findings is reduced" (p. 18).

Mentions of the Replication Crisis

The replication crisis was discussed in six of the 12 IPTs, typically in a paragraph or two immediately following the general discussion of replication in the scientific method section of the book. In these reviews of the crisis, authors typically acknowledge concerns with replication in the discipline. Ciccarelli and White (2017), for example, state that "some evidence suggests that editors of peer-reviewed journals have tended to publish positive research results overall rather than embrace direct replications or 'old' knowledge or negative results studies" (p. 22). Kalat (2017) similarly acknowledges that "in spite of the agreed importance of replication, not many psychologists try to replicate someone else's findings" (p. 47). A number of IPT authors cite the Open Science Collaboration (2015) study's failure to replicate 64 of 100 studies and other similar replication studies (e.g., Ciccarelli & White, 2017; Myers & DeWall, 2018). IPT authors who discuss the crisis also regularly cite concerns about researchers misrepresenting their findings and call for "more replications and greater transparency as researchers increasingly disclose their detailed methods and data" (Myers & DeWall, 2018, p.20)." Interestingly, none of the authors discussed the origin of the crisis in 2011 and the role of Bem's controversial research findings in it.

Some IPT authors note the positive changes that the replication crisis helped to instigate within the discipline. Kalat (2017), for example, writes that "More and more scientists have been calling for attempts to replicate a result, using exactly the same procedure as the original study (Simons, 2014), and several journals have agreed to publish the results, whatever they may be" (p. 47). However, by and large, the IPT authors who address the crisis downplay its severity. Some diffuse the crisis by noting that "the same problem occurs in other fields also" (Kalat, 2017, p. 47). Others state that the media and a number of psychologists have exaggerated the issues and focused too narrowly and unfairly on psychology (e.g., Myers & DeWall, 2018). Authors also point to weaknesses in recent studies that have attempted to replicate some of the most well-known studies in the discipline, casting doubt on the credibility of the attempted replications (Hockenbury & Nolan, 2018; Kalat, 2017; Rathus et al., 2017). Myers and DeWall (2018) take this last point to a meta-level, asserting that those studies that have attempted to replicate previous studies must themselves be replicated before any confidence can be placed in their findings.

The Replication Status of Highly Cited Studies

Researchers identified all the studies that were cited by no fewer than three IPT authors and then screened those studies as to their capacity to be replicated. This resulted in a total of 90 replicable articles. One-third of those studies were randomly selected and analyzed to determine whether they had been directly and/or conceptually replicated. Table 2 lists the author(s) and year of each study and indicates its replication status. Researchers found that 10 of the 30 studies had been directly replicated, and 23 of the 30 studies had been conceptually replicated (note that these are not mutually exclusive categories). Four of the studies had not been replicated either directly or conceptually.

Table 2 also shows the number and ratings of excerpts across the 12 IPTs in which the authors cited and described the results of the 30 selected studies. It is important to note that in no case were the scores from both raters on an excerpt identified and confirmed as biased, so all excerpts are represented by at least one rating that was consistent with training. Ratings indicated that 39 of the 172 excerpts (23%; Cohen's Kappa = .70) used language that in some way implicated the replication status of the studies, with 9% of the excerpts explicitly indicating replication status (Cohen's Kappa = .80). The raters identified language connoting strong confidence in the reliability and validity of the findings in 81% of the excerpts (Cohen's Kappa = .62).

Only four of the thirty sampled studies have not yet been directly or conceptually replicated (Archer, 2004; Gottesman, 1991; Hirst et al., 2015; Trahan et al., 2014). This speaks well to the practice and prevalence of replication in psychology, at least for more highly cited studies. However, none of the IPT authors explicitly noted the replication status of these unreplicated studies, though the raters did detect implied references to replication in two of the study descriptions. The ratings also indicate that most of the IPT authors who cited and described these non-replicated studies used language connoting strong confidence in the veracity and generalizability of the findings in their descriptions. On the other hand, raters detected three studies that have been at least directly replicated (Caspi et al., 2002; Ferguson, 2015; Freedman & Fraser, 1966) that were not explicitly or implicitly identified by IPT authors as having been replicated and that most IPT authors described using more tentative language (i.e., language connoting weaker confidence in the veracity of the results).

Table 2. Replication Status of Thirty Studies.

Article	Replication Status	No. of IPT excerpts citing the study	No. of IPT excerpts explicitly mentioning replication status	No. of IPT excerpts implying replication status	No. of IPT excerpts with no indication of replication status	No. of IPT excerpts using confident language
Allport & Odbert (1936)	Conceptual	5	0	3	2	5
Archer (2004)	Not Replicated	4	0	0	4	3
Asch (1956)	Direct & Conceptual	6	3	2	1	5
Bandura (1986)	Conceptual	8	1	3	4	8
Bartlett (1932)	Direct & Conceptual	7	0	0	7	7
Burger (1999)	Conceptual	6	2	0	4	4
Caspi et al. (2002)	Direct & Conceptual	3	0	0	3	1
Cepeda et al. (2006)	Conceptual	5	2	1	2	5
Clancy (2005)	Conceptual	6	0	0	6	3
Duckworth & Seligman (2005)	Direct & Conceptual	6	3	1	2	6
Eagly et al. (1991)	Conceptual	5	0	1	4	5
Ferguson (2015)	Direct & Conceptual	4	0	0	4	0
Freedman & Fraser (1966)	Direct	7	0	0	7	1
Gottesman (1991)	Not Replicated	8	0	1	7	3
Hirst et al. (2015)	Not Replicated	5	0	1	4	5
Hyde (2005)	Direct	4	0	0	4	4
Karau & Williams (1993)	Conceptual	6	2	0	4	5
Killingsworth & Gilbert (2010)	Conceptual	3	0	0	3	2
Kirsch (2010)	Direct & Conceptual	4	0	0	4	3
Latané et al. (1979)	Conceptual	5	0	3	2	4
Laumann et al. (1994)	Conceptual	4	0	0	4	4
Milgram (1963)	Direct & Conceptual	8	1	0	7	5
Pavlov (1927)	Conceptual	9	1	3	5	9
Peterson & Peterson (1959)	Conceptual	10	0	1	9	9
Rosenhan (1973)	Direct	7	0	0	7	5
Savic et al. (2005)	Conceptual	4	2	1	1	4
Tolman & Honzik (1930)	Conceptual	8	0	0	8	8
Trahan et al. (2014)	Not Replicated	3	0	1	2	3
Tversky & Kahneman (1973)	Conceptual	4	0	0	4	4
Watson & Rayner (1920)	Conceptual	8	0	0	8	8
Totals		172	17	22	133	139

DISCUSSION

The results of this study suggest a few common trends across the content of traditionally published IPTs like those examined in this study. First, there will likely be some discussion of replication, which is typically found in the first chapter of the book, where the principles of science are reviewed. There may also be some coverage of the replication crisis, though the authors may not share the context of its origin or treat it as a crisis. Additionally, it is unlikely that replication or the replication crisis will be mentioned again elsewhere in the book, including as it pertains to the replication status of the studies cited in the book. Finally, the replication status of studies is not only unlikely to be reported or implied, but in most cases, IPT authors will use language in their descriptions of the studies that connotes strong confidence in the validity and reliability of the studies, whether the studies have been replicated or not.

These trends in the IPTs examined in this study suggest at least three strategies instructors could employ to help teach their students to think scientifically and critically about replication. These strategies are designed so that any instructor can use them regardless of the specific content of their chosen IPT. First, instructors can

supplement the replication relevant content of the IPT with resources and materials that expand upon that content and further develop students' scientific and critical thinking skills. Second, course instructors can create experiential learning opportunities that give students direct exposure to replication research. Finally, instructors can teach students how to investigate the replication status of key studies covered in the course and how that status can and should be reflected in the way the study is presented and described.

Strategy #1: Supplement IPT Content

Replication

There are many publications at varying levels of sophistication that can be used to add detail to lecture notes and slide decks or can be assigned to students as additional reading on the topic of replication. Instructors who want to emphasize scientific thinking, for example, can assign students book chapters, such as "Guiding Principles for Scientific Inquiry" (National Research Council, 2002). This chapter introduces the philosophy of science supporting replication and describes in detail the impact and importance of reproducibility in advancing knowledge. Chapters like this help students understand the entire scientific enterprise more fully, as well as the role of replication within it. This chapter was also published before the replication crisis, which provides students with a pre-crisis sense of the importance of the concept that can be compared with post-crisis sources.

Journal articles also provide an increased understanding of replication within the context of scientific research, but typically do so with more specificity in terms of the disciplines involved. For example, an editorial written by the editors of *Management Review Quarterly* (Block & Kuckertz, 2018) lists in a clear and straightforward manner seven principles of replication for the social sciences, noting differences from replication in the natural sciences as they go. Their first principle, for example notes that social science research can only account for a small percentage of the variance in the dependent variable and thus can only suggest "quasi-laws" of human behavior (para. 5). Understanding these differences and seeing what journal editors are looking for in potentially publishable replications in a social science field informs students about what really matters to the discipline through the eyes of scholars who serve as quality control experts in their field. Psychology instructors could further narrow this focused approach to psychology journal articles (Cherry, 2023), noting how the practice of replication in psychology compares to other social sciences.

There are also articles that emphasize critical thinking about replication. For example, Goodman et al. (2016) critically examine the "nonstandard and unsettled" (p. 341) ways that research reproducibility is described across disciplines, resulting in misconceptions and, at times, the use of reproducibility terms as a "surrogate for 'truth'" (Goodman et al., 2016, p. 341). Sharing this concern, Rabeyron (2020) calls into question the feasibility and fit of replication to Psi and other phenomena and considers the need for a "post-modern psychology" that appreciates the "complexity of consciousness" and "the entanglement of the observer and the observed" (p. 8). He uses Bem's (2011) research that kicked off the replication crisis and the Ganzfeld protocol to help readers think critically about potential biases in replication that might hinder the advancement of knowledge in this important psychological domain. Instructors could effectively use supplementary articles like these to help students examine the assumptions and implications of replication in psychological science and to consider alternative approaches to reproducibility that might yield meaningful outcomes.

The Replication Crisis

Before looking outside of IPTs for material that takes up the replication crisis in a manner that is accessible to introductory students and can support their scientific and critical thinking about this topic, it is important to note that in light of the crisis, several of the newer editions of the IPTs examined in this study provide greater detail and depth in their treatment of replication and the replication crisis (e.g., Coon et al., 2022; Myers & DeWall, 2020; Schacter et al., 2020; Wade et al., 2020). Indeed, some IPT authors have made this a highlighted feature of their newest editions, noting that they now provide "expanded coverage of replication" (Phelps et al., 2022, p. xiii), with 1-2 pages of discussion on the topics of replication and the replication crisis rather than the 2-3 paragraphs in previous editions. A few authors (e.g., Myers & DeWall, 2020) even note that they have intentionally excluded studies that were not successfully replicated in recent attempts, like the studies that did not replicate in the 2015 Open Science Collaborative study. Others (e.g., Phelps et al., 2022) state that their "textbook features studies that have replicated or would likely replicate based on the rigor of their methods" (p. 18). This expanded coverage of replication and the crisis

provides instructors more material within the IPT itself to work with as they teach students to think critically and scientifically.

Still, earlier editions of IPTs, including those used in this study, remain very popular, especially in cases of university initiatives to provide low or no-cost textbook options for students. Indeed, it has become increasingly common for instructors to use more affordable earlier editions of IPTs (McGowan, 2020). Consequently, supplementary materials may still be needed. Fortunately, there is a bounty of articles written in accessible language that can walk students through the history of the replication crisis, both in science generally (e.g., Baker, 2016; Lehrer, 2010) and in psychology specifically (e.g., Gray et al, 2021). Several of these articles discuss what is being done to improve the methods (e.g., Hedges et al, 2024) and ethics (e.g., Peels & Bouter, 2023) of scientific research to resolve the replication crisis in psychology and elsewhere. These articles can help students understand replication's epistemological importance as well as science's goal and value of self-correction.

Strategy #2: Provide Experiential Learning Opportunities

Another strategy that can help students learn and practice scientific and critical thinking is to create experiential learning replication opportunities in the Introduction to Psychology course. The Collaboration Replications and Education Project (CREP) was established in 2014 to provide guidelines and opportunities for teaching and mentoring students in conducting direct replications of psychological research (Grahe et al., 2014). The CREP website (https://osf.io/stdgm/) provides a list of studies at varying levels of complexity and technology that can be directly replicated, usually within the course of a semester. CREP provides detailed instructions for carrying out the replication, and a contact person from CREP is available for consultation and direction. It is even possible to publish the results of the replication (Wagge et al., 2019). As noted in our introduction, Bem (2011) created materials to encourage replication of his precognitive studies, which are commonly cited as having ignited the replication crisis. These materials could be used within a classroom setting. Not only would this introduce students to topics related to replication and directly to the crisis, but it could raise awareness of other scientific dilemmas, such as how scientists react when findings fall outside of the current mainstream worldview. It would also expose students to the extensive breadth of anomalistic research that is often excluded or underreported in IPTs as well.

Several instructors who have built replication research into their classes discuss the pedagogical value of practicing replication in the classroom and identify its impact on the objectives of scientific and critical thinking in psychology (e.g., Frank & Saxe, 2012). Student participation in these studies can range from conducting the study as researchers under the instructor's supervision to being research participants. There are several ways to build experiential learning into the introductory course to teach the importance of replication, curb the crisis of replication, and impact student success (e.g., presentations at undergraduate research conferences and possibly publication).

Strategy #3: Teach Students to Investigate the Replication Status of Studies

Another strategy instructors could integrate into their teaching is to create assignments for students that allow them to investigate the replication status of studies. Following the example of this study, students can investigate the replication status of studies that have impacted the discipline (like those examined in this article). Using the "cited by" feature in Google Scholar and other search engines, students can work in small groups to search the content of articles that cite the key study to see if the study has been replicated, and, if so, whether it was a direct or conceptual replication. Instructors could also assign students to write a description of the study's results in which they identify the replication status of the study and use language connoting more or less confidence in the validity and reliability of the study based on the replication status. This will help students think critically about how studies should be described, not only by textbook and journal authors, but also by the students themselves when they share the results of studies they read about in their Introduction to Psychology class in presentations, publications, and informal conversations.

LIMITATIONS, IMPLICATIONS, AND APPLICATIONS

One limitation of the present study is that it necessarily reflects a snapshot in time and a delimited scope. The textbooks examined were published on average 6 years after the replication crisis in psychology began and two years after the Open Science Collaboration (2015) study was published, a time when the crisis was in full swing

and receiving a lot of attention. The results also reflect the content of popular IPTs published in traditional formats. It does not include more recently published editions, though we did examine and report on a sample of those newer editions in the discussion section. The study also omits OER textbooks, which do not have page limitations and other restrictions placed on traditionally published books and therefore are able to be more responsive and immediately revisable in light of current trends. Future research could investigate the treatment of replication in OER and newer edition IPTs to flesh out a more comprehensive understanding of the treatment of replication and the replication crisis in IPTs. This would be very helpful and would allow researchers to chronicle any changes over time. However, it would not likely affect the value of the three strategies for teaching critical thinking about replication and the replication crisis described here. We believe that these strategies, which were developed based on the results of this study—supplementing IPT content, giving students opportunities to practice replication, and teaching students to examine the replication status of key studies—can only improve students' scientific and critical thinking skills, regardless of the status of replication in the discipline at any given time and the IPT content that addresses it.

A key implication of the findings of the present study is that they raise important questions about replication in psychology. We address these questions here for the consideration of readers generally, but specifically for readers of this journal who teach replication, whether in an Introduction to Psychology course or in a class on another psychology subject. These questions, even if not answered in a course lecture or discussion, can be very helpful in deepening students' critical and scientific thinking about replication, but also about the philosophy of science that informs it, and can easily be taken for granted (Slife et al., 2005). Clearly, the importance of replication to the discipline and its undergirding philosophy of science has been highlighted in the wake of the replication crisis. Prior to the crisis, however, studies could go unreplicated for years, and yet they would be regularly cited in IPTs and other publications with no mention or implication of their replication status and without using more tentative language in the descriptions of the findings of the studies.

The Milgram (1963) study, for example, is one of the most controversial studies in the history of psychology. It was not replicated for 45 years (Burger, 2009). Yet, its results have been presented in almost every IPT for several decades without mention of its replication status and with language connoting high confidence in the reliability and validity of the findings. This is well illustrated by this excerpt from an IPT published prior to the Burger replication that did not state or imply that the Milgram study had not been replicated and yet confidently generalized the findings of the study beyond the sample of the research participants: "Social conditioning for obeying legitimate authorities is so strongly ingrained that people often lack the words or the ways to do otherwise (Kasschau, 2003, p. 560). Our own study shows that even in the wake of the crisis, and after the Milgram study has been replicated, the replication status of the Milgram study is rarely stated or implied, and there is no corresponding effect on the use of confident language in study descriptions. This trend is consistent with the other controversial studies included in our sample (e.g., Asch, 1956; Rosenhan, 1973).

It is interesting to note that this same trend did not occur in the case of Bem's (2011) study, even though Bem provided the materials needed to replicate the research, the study was replicated some 90 or so times and subjected to a meta-analysis. Additionally, as was the case with Milgram and Asch, the article was published in a highly regarded peer-reviewed journal and was authored by an esteemed social psychologist working at a top-tier research university. Instead, in Bem's case, immediate calls for replication were issued. Recall that for the Open Science Collaboration and others who were concerned with the controversial findings of the Bem article, along with a number of other publications with unexpected findings, replication became the key tool to be used to address and assess the reliability and validity of these studies. Given the reasons discussed in the introduction of this article, this makes a great deal of sense. What makes less sense is the differential treatment of this article compared to others that have presented controversial findings before. Unlike Milgram's study and others with unexpected results that had not been replicated for a long time, Bem's study, which was immediately subjected to replication, is not cited regularly in IPTs, at least not in the 2017 and 2018 editions we reviewed. What was it, then, about Bem's study that kicked off the replication crisis and resulted in its omission from IPTs?

An overly easy answer would be that the findings of Bem's study are not only unexpected, but they are also unexplainable within the scientific worldview of mainstream psychology and the fundamental assumptions psychologists use to understand reality. The problem with this response is that Bem's now infamous *Feeling the Future*

study was in no way the first on psi phenomena, nor was it the first of its kind to embrace replication. By the time his study was published in 2011, 70 years of solid empirical research had already been conducted in this area, with replication being one of its chief cornerstones. Readers of this journal who are versed in the history of Parapsychology, a term coined by German philosopher Max Dessoir and taken up by J.B. Rhine, will recall that repeatability and replication formed for Rhine the crux of his entire philosophy, which launched the American Parapsychology movement (McVaugh & Mauskopf, 1976).

Rhine believed it was necessary to conduct huge numbers of repeated trials within a single study as well as across separate studies. For example, in one single study, he conducted 2800 trials. By 1940, he had accumulated close to a million trials across 33 precognitive experiments, 27 of which produced statistically significant results. Several other labs successfully attempted replications of Rhine's work. A meta-analysis by Honorton & Ferrari (1989) examined 309 independent precognitive experiments conducted by 62 experimenters from 1935 to 1987 and found statistically significant results as well.

Rhine's strength in numbers philosophy is reflected in the many meta-studies conducted in the past three decades within the field of parapsychology, including those looking at pre-sentiment experiments, which, in a related vein to Bem's studies, measure automatic physiological responses of participants prior to receiving a future stimulus. Tressoldi (2011) analyzed 37 of these experiments across six protocols, finding an overall effect size of a Cohen's d of 0.26. According to Rabin (2016), the odds against chance for these were "6.3 × 1017, i.e., 625,000,000,000,000,000 to 1, which is "almost identical to the average effect size reported in 25,000 experiments conducted over a century of social psychology research…it allows us to seriously entertain the idea that presentiment *does* in fact exist." (p.1). Mossbridge et al (2012) conducted another meta-analysis the following year of published and unpublished presentiment studies, finding similar results. Clearly, researchers studying psi phenomena conduct scientific experimentation, replication, and meta-analyses, and they publish the results of their research in peer-reviewed journals, so the claim that Bem's (2011) research was treated differently because psi phenomena fall outside of the purview of psychological science and reproducibility would need some hefty justification.

One application that follows from the implication of the differential treatment of the Bem (2011) study, and others like it, is for future research to examine the worldview assumptions that inform mainstream psychology, to investigate potential systemic biases against research on psi phenomena, and to examine the ways in which replication narratives might be exploited to justify this differential treatment. Such research would be very helpful in better understanding the context surrounding the replication crisis and could be a useful resource to instructors who teach critical and scientific thinking about replication. It is beyond the scope of this article to draw or even suggest any conclusions about the differential treatment Bem's (2011) research received compared to other studies with controversial findings, including studies that went unreplicated for a long time. We note here only that despite the substantial body of research on psi phenomena just reviewed, and despite the central focus on replication across that research, all of the textbooks we examined were devoid of any mention of Bem's research and of this history of precognitive studies and adherence by parapsychologists to scientific standards to achieve repetitive and reliable results. Yet, that research was placed front and center as evidence of the replication crisis.

Future research may want to investigate potential systemic biases within mainstream psychology that target research that not only presents controversial or anomalous findings, but that is open to theories and concepts that are inconsistent with the worldview assumptions of normative psychology and is, as a result targeted and/or excluded from the mainstream of the discipline, often on the basis of claims of a scientific nature that do not in fact apply. One of the authors of this study has conducted exactly this kind of research regarding another excluded conceptualization (theism) in which the claims of mainstream psychology that such a conceptualization has no place in an empirical psychology have been clearly refuted and shown to reflect disciplinary worldview biases (e.g., Reber et al., 2012; Slife & Reber, 2009; Slife & Reber, 2021).

CONCLUSION

The importance of replication to psychological science has been well established since the birth of the discipline and has been reaffirmed through the recent replication crisis (Ebersole et al., 2019; Klein, Cook, et al., 2019; Klein, Vianello, et al., 2018; Makel et al., 2012; Open Science Collaboration, 2015). Though psychologists may disagree about the label "crisis," they have certainly become more

vigilant about replication and the issues attending it, and they have strengthened their resolve to demonstrate the importance of replication within scientific psychology (Shrout & Rodgers, 2018). Several IPT authors have updated the content of their texts to reflect this reaffirmation and increased accountability, but given ever tighter word and page limits, there is only so much detail they can go into on this or any topic.

This study examined the content of the most popular IPTs for common themes and trends in the coverage of replication, the replication crisis, and the replication status of the studies cited and described in these textbooks. The results of that examination suggest several strategies instructors could take to expand upon the content of the IPT in teaching their students to think scientifically and critically about replication in psychology. As instructors create activities, assignments, and experiential learning opportunities that challenge students to think more carefully and deeply about the principles of replication, they help to ensure that this pillar of science remains strong and front of mind, not only among psychology majors who are the future stakeholders of the discipline but also among the general public, many of whom will have been students in an Introduction to Psychology course on their way to other majors and careers.

REFERENCES

Allport, G. W., & Odbert, H. S. (1936). Trait-names: A psycho-lexical study. P*sychological Monographs*, *47*(1), i–171. https://doi.org/10.1037/h0093360

American Psychological Association. (2023). *APA guidelines for the undergraduate psychology major, version 3.0: Empowering people to make a difference in their lives and communities*. American Psychological Association. https://www.apa.org/about/policy/undergraduate-psychology-major.pdf

Anglin, S. M., & Edlund, J. E. (2019). Perceived need for reform in field-wide methods and the teaching of replication, interpretation, and transparency. *Psychology Learning & Teaching*, *19*(1), 60–76. https://doi.org/10.1177/1475725719859453

Archer, J. (2004). Sex differences in aggression in real-world settings: A meta-analytic review. *Review of General Psychology*, *8*(4), 291–322. https://doi.org/10.1037/1089-2680.8.4.291

Asch, S. E. (1956). Studies of independence and conformity: I. A minority of one against a unanimous majority. *Psychological Monographs: General and Applied*, *70*(9), 1–70. https://doi.org/10.1037/h0093718

Baker, M. (2016). 1,500 scientists lift the lid on reproducibility. *Nature*, *533*, 452–454. https://doi.org/10.1038/533452a

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice Hall. https://doi.org/10.4135/9781446221129

Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge University Press. https://doi.org/10.1017/cbo9780511759185

Bem, D. J. (2011). Feeling the future: Experimental evidence for anomalous retroactive influences on cognition and affect. *Journal of Personality and Social Psychology*, *100*(3), 407–425. https://doi.org/10.1037/a0021524

Bem, D. J., Tressoldi, P. E., Rabeyron, T., & Duggan, M. (2016). Feeling the future: A meta-analysis of 90 experiments on the anomalous anticipation of random future events [version 2; peer review: 2 approved]. *F1000Research*, *4*, 1188. https://doi.org/10.12688/f1000research.7177.2

Block, J., & Kuckertz, A. (2018). Seven principles of effective replication studies: Strengthening the evidence base of management research. *Management Review Quarterly*, *68*, 355–359. https://doi.org/10.1007/s11301-018-0149-3

Burger, J. M. (1999). The foot-in-the-door compliance procedure: A multiple process analysis review. *Personality and Social Psychology Review*, *3*(4), 303–325. https://doi.org/10.1207/s15327957pspr0304_2

Burger, J. M. (2009). Replicating Milgram: Would people still obey today? *American Psychologist*, *64*(1), 1–11. https://doi.org/10.1037/a0010932

Camerer, C. F., Dreber, A., Holzmeister, F., Ho, T.-H., Huber, J., Johannesson, M., Kirchler, M., Nave, G., Nosek, B. A., Pfeiffer, T., Altmejd, A., Buttrick, N., Chan, T., Chen, Y., Forsell, E., Gampa, A., Heikensten, E., Hummer, L., Imai, T., … Wu, H. (2018). Evaluating the replicability of social science experiments in *Nature* and *Science* between 2010 and 2015. *Nature Human Behaviour*, *2*(9), 637–644. https://doi.org/10.1038/s41562-018-0399-z

Caspi, A., McClay, J., Moffitt, T. E., Mill, J., Martin, J., Craig, I. W., Taylor, A., & Poulton, R. (2002). Role of genotype in the cycle of violence in maltreated children. *Science*, *297*(5582), 581–584. https://doi.org/10.1126/science.1072290

Cepeda, N. J., Pashler, H., Vul, E., Wixted, J. T., & Rohrer, D. (2006). Distributed practice in verbal recall tasks: A review and quantitative synthesis. *Psychological Bulletin*, *132*(3), 354–380. https://doi.org/10.1037/0033-2909.132.3.354

Chandler, M. (2019, June 28). AAP calls for closer regulation of Amazon and Google. *The Bookseller*. https://www.thebookseller.com/news/aap-calls-closer-regulation-amazon-and-google-1027576

Cherry, K. (2023). What is replication in psychology research? *Verywell Mind*. https://www.verywellmind.com/what-is-replication-2795802

Ciccarelli, S. K., & White, J. (2017). *Psychology: An exploration* (5th ed.). Pearson.

Clancy, S. A. (2005). *Abducted: How people come to believe they were kidnapped by aliens*. Harvard University Press. https://doi.org/10.4159/9780674029576

Collisson, B., Kellogg, J., & Rusbasan, D. (2015). Perceptions of psychology as a science: The effect of citation within introductory textbooks. *The Free Library*. https://www.thefreelibrary.com/Perceptions+of+-psychology+as+a+science%3a+the+effect+of+citations...-a0403448489

Coon, D., Mitterer, J. O., & Martini, T. S. (2022). *Introduction to psychology*: Gateways to mind and behavior (16th ed.). Cengage Learning.

Diener, E., & Biswas-Diener, R. (2024). The replication crisis in psychology. In R. Biswas-Diener & E. Diener (Eds.), *Noba textbook series: Psychology*. DEF Publishers. http://noba.to/q4cvydeh

Dobyns, Y. H., Dunne, B. J., Jahn, R. G., & Nelson, R. D. (2004). The MegaREG experiment: Replication and interpretation. *Journal of Scientific Exploration*, *18*(3), 369–397.

Duckworth, A. L., & Seligman, M. E. P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science*, *16*(12), 939–944. https://doi.org/10.1111/j.1467-9280.2005.01641.x

Eagly, A. H., Ashmore, R. D., Makhijani, M. G., & Longo, L. C. (1991). What is beautiful is good, but...: A meta-analytic review of research on the physical attractiveness stereotype. *Psychological Bulletin*, *110*(1), 109–128. https://doi.org/10.1037/0033-2909.110.1.109

Ebersole, C. R., Mathur, M. B., Baranski, E., Bart-Plange, D., Buttrick, N., Chartier, C. R., Corker, K. S., Corley, M., Hartshorne, J., Ijzerman, H., Lazarevic, L., Rabagliati, H., Ropovik, I., Aczel, B., Aeschbach, L. F., Andrighetto, L., Arnal, J., Arrow, H., Babincak, P., ... Nosek, B. A. (2019, October 3). Many Labs 5: Testing pre-data collection peer review as an intervention to increase replicability. *Advances in Methods and Practices in Psychological Science*, *3*(3), 309–331. https://doi.org/10.1177/2515245920958687

Feest, U. (2019). Why replication is overrated. *Philosophy of Science*, *86*(5), 895–905. https://doi.org/10.1086/705451

Feldman, R. S. (2018). *Understanding psychology* (14th ed.). McGraw-Hill Education.

Ferguson, C. J. (2015). Do angry birds make for angry children? A meta-analysis of video game influences on children's and adolescents' aggression, mental health, prosocial behavior, and academic performance. *Perspectives on Psychological Science*, *10*(5), 646–666. https://doi.org/10.1177/1745691615592234

Fidler, F., & Wilcox, J. (2021). Reproducibility of scientific results. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy* (Summer 2021 ed.). Stanford University Press. https://plato.stanford.edu/archives/sum2021/entries/scientific-reproducibility/

Frank, M. C., & Saxe, R. (2012). Teaching replication. *Perspectives on Psychological Science*, *7*(6), 600–604. https://doi.org/10.1177/1745691612460686

Freedman, J. L., & Fraser, S. C. (1966). Compliance without pressure: The foot-in-the-door technique. *Journal of Personality and Social Psychology*, *4*(2), 195–202. https://doi.org/10.1037/h0023552

Gernert, D. (2010). How to reject any scientific manuscript. *Journal of Scientific Exploration*, *22*(2), 233–243.

Goodman, S. N., Fanelli, D., & Ioannidis, J. P. A. (2016). What does research reproducibility mean? *Science Translational Medicine*, *8*(341), Article 341ps12. https://doi.org/10.1126/scitranslmed.aaf5027

Gottesman, I. I. (1991). *Schizophrenia genesis: The origins of madness*. W. H. Freeman.

Grahe, J., Brandt, M., Ijzerman, H., & Cohoo, J. (2014). Replication education. *Association for Psychological Science*. https://www.psychologicalscience.org/observer/replication-education

Gray, K., Arnott-Hill, E., & Benson, O. (2021). Module 4: The science of psychology: Tension and conflict in a dynamic discipline. In *Introduction to psychology*. College of DuPage Digital Press. https://cod.pressbooks.pub/introductiontopsychology/chapter/the-science-of-psychology-tension-and-conflict-in-a-dynamic-discipline/

Griggs, R. A. (2017). *Psychology: A concise introduction* (5th ed.). Worth Publishers.

Griggs, R. A., & Whitehead, G. I. (2014). Coverage of the Stanford prison experiment in introductory social psychology textbooks. *Teaching of Psychology*, *41*(4), 318–324. https://doi.org/10.1177/0098628314549703

Griggs, R. A., & Whitehead, G. I. (2015). Coverage of Milgram's obedience experiments in social psychology textbooks: Where have all the criticisms gone? *Teaching of Psychology*, *42*(4), 315–322. https://doi.org/10.1177/0098628315603065

Gurung, R. A. R., Hackathorn, J., Enns, C., Frantz, S., Cacioppo, J. T., Loop, T., & Freeman, J. E. (2016). Strengthening introductory psychology: A new model for teaching the introductory course. *American Psychologist*, *71*(2), 112–124. https://doi.org/10.1037/a0040012

Hedges, L., Hullman, J., Rometty, G., Tackett, J., & Uzzi, B. (2024, February 28). 'An existential crisis' for science: What IPR scholars are doing to solve the

replication crisis. *Northwestern University Institute for Policy Research*. https://www.ipr.northwestern.edu/news/2024/an-existential-crisis-for-science.html

Hirst, W., Phelps, E. A., Meksin, R., Vaidya, C. J., Johnson, M. K., Mitchell, K. J., & Olsson, A. (2015). A ten-year follow-up of a study of memory for the attack of September 11, 2001: Flashbulb memories and memories for flashbulb events. *Journal of Experimental Psychology: General*, *144*(3), 604–623. https://doi.org/10.1037/xge0000055

Hockenbury, S. E., & Nolan, S. A. (2018). *Psychology* (8th ed.). Worth Publishers.

Holden, C. J., & Goodwin, G. (2018). The importance of replication. In V. Zeigler-Hill & T. Shackelford (Eds.), *Encyclopedia of personality and individual differences*. Springer. https://doi.org/10.1007/978-3-319-28099-8_1352-1

Honorton, C., & Ferrari, D. C. (1989). "Future telling": A meta-analysis of forced-choice precognition experiments, 1935–1987. *Journal of Parapsychology*, *53*(4), 281–308.

Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist*, *60*(6), 581–592. https://doi.org/10.1037/0003-066X.60.6.581

Iso-Ahola, S. E. (2020). Replication and the establishment of scientific truth. *Frontiers in Psychology*, *11*, 2183. https://doi.org/10.3389/fpsyg.2020.02183

Kalat, J. W. (2017). *Introduction to psychology* (11th ed.). Cengage Learning.

Karau, S. J., & Williams, K. D. (1993). Social loafing: A meta-analytic review and theoretical integration. *Journal of Personality and Social Psychology*, *65*(4), 681–706. https://doi.org/10.1037/0022-3514.65.4.681

Kasschau, R. A. (2003). *Understanding psychology*. Glencoe/McGraw-Hill.

Katz, D. (2022). Don't judge a book by its cover: A case study and comparative analysis of popular vs. academic psychology books. *Journal of Scientific Exploration*, *36*(2), 233–250. https://doi.org/10.31275/20222463

Klein, R. A., Cook, C. L., Ebersole, C. R., Vitiello, C. A., Nosek, B. A., Chartier, C. R., Ahn, P. H., Brady, A. J., Christopherson, C. D., Clay, S., Collisson, B., Crawford, J. T., Cromar, R., Gardiner, G., Gosnell, G. L., Grahe, J., Hall, C., Howard, I., … Ratliff, K. A. (2019). Many Labs 4: Failure to replicate mortality salience effect with and without original author involvement. *PsyArXiv*. https://doi.org/10.31234/osf.io/vef2c

Klein, R. A., Vianello, M., Haselmann, F., Adam, B. G., Adams, R. B., Alper, S., Aveyard, M., Axt, J. R., Babalola, M. T., Bahník, Š., Batra, R., Berkics, M., Bernstein, M. J., Berry, D. R., Bialobrzeska, O., Binan, E. D., Bocian, K., Brandt, M. J., Busching, A. C., … Nosek, B. A. (2018). Many Labs 2: Investigating variation in replicability across samples and settings. *Advances in Methods and Practices in Psychological Science*, *1*(4), 443–490. https://doi.org/10.1177/2515245918810225

Korbmacher, M., Azevedo, F., & Pennington, C. R. (2023). The replication crisis has led to positive structural, procedural, and community changes. *Community Psychology*, *1*, 3. https://doi.org/10.1038/s44271-023-00003-2

Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy mind. *Science*, *330*(6006), 932. https://doi.org/10.1126/science.1192439

Kirsch, I. (2010). *The emperor's new drugs: Exploding the antidepressant myth*. Basic Books.

Latané, B., Williams, K., & Harkins, S. (1979). Many hands make light the work: The causes and consequences of social loafing. *Journal of Personality and Social Psychology*, *37*(6), 822–832. https://doi.org/10.1037/0022-3514.37.6.822

Laumann, E. O., Gagnon, J. H., Michael, R. T., & Michaels, S. (1994). *The social organization of sexuality: Sexual practices in the United States*. University of Chicago Press.

Lehrer, J. (2010, December 5). The truth wears off. *The New Yorker*. https://www.newyorker.com/magazine/2010/12/13/the-truth-wears-off

Lewandowsky, S., & Oberauer, K. (2020). Low replicability can support robust and efficient science. *Nature Communications*, *11*, 358. https://doi.org/10.1038/s41467-019-14203-0

Lilienfeld, S. O., Lynn, S. J., & Namy, L. L. (2017). *Psychology: From inquiry to understanding* (4th ed.). Pearson.

Makel, M. C., Plucker, J. A., & Hegarty, B. (2012). Replications in psychology research: How often do they really occur? *Perspectives on Psychological Science*, *7*(6), 537–542. https://doi.org/10.1177/1745691612460688

McBurney, D. H. (1996). *How to think like a psychologist: Critical thinking in psychology*. Prentice Hall.

McGowan, V. (2020). Institution initiatives and support related to faculty development of open educational resources and alternative textbooks. *Open Learning: The Journal of Open, Distance and e-Learning*, *35*(1), 24–45. https://doi.org/10.1080/02680513.2018.156232

McHugh, M. L. (2012). Interrater reliability: The kappa statistic. *Biochemia Medica*, *22*(3), 276–282. https://doi.org/10.11613/BM.2012.031

McVaugh, M., & Mauskopf, S. H. (1976). J. B. Rhine's *Extra-sensory perception* and its background in psychical research. *Isis*, *67*(2), 221–233. https://doi.org/10.1086/351583

Miller, B., & Gentile, B. F. (1998). Introductory course content and goals. *Teaching of Psychology*, *25*(2), 89–96. https://doi.org/10.1207/s15328023top2502_2

Milgram, S. (1963). Behavioral study of obedience. *Journal of Abnormal and Social Psychology*, *67*(4), 371–378. https://doi.org/10.1037/h0040525

Mossbridge, J., Tressoldi, P., & Utts, J. (2012). Predictive physiological anticipation preceding seemingly unpredictable stimuli: A meta-analysis. *Frontiers in Psychology*, *3*, 390. https://doi.org/10.3389/fpsyg.2012.00390

Myers, D. G., & DeWall, C. N. (2018). *Exploring psychology in modules* (11th ed.). Worth Publishers.

Myers, D. G., & DeWall, C. N. (2020). *Exploring psychology in modules* (13th ed.). Worth Publishers.

National Academies of Sciences, Engineering, and Medicine. (2019). Chapter 7: Confidence in science. In *Reproducibility and replicability in science*. The National Academies Press. https://doi.org/10.17226/25303

National Research Council. (2002). Chapter 3: Guiding principles for scientific inquiry. In *Scientific research in education*. National Academies Press. https://doi.org/10.17226/10236

Nature. (2021, December 15). Replicating scientific results is tough – but essential. *Nature*. https://www.nature.com/articles/d41586-021-03736-4

Nosek, B. A., & Errington, T. M. (2017). Reproducibility in cancer biology: Making sense of replications. *eLife*, *6*, e23383. https://doi.org/10.7554/eLife.23383

Nosek, B. A., & Errington, T. M. (2020). What is replication? *PLOS Biology*, *18*(3), e3000691. https://doi.org/10.1371/journal.pbio.3000691

Open Science Collaboration. (2015). Estimating the reproducibility of psychological science. *Science*, *349*(6251), aac4716. https://doi.org/10.1126/science.aac4716

Pavlov, I. P. (1927). *Conditioned reflexes*. Oxford University Press.

Peels, R., & Bouter, L. (2023). Replication and trustworthiness. *Accountability in Research*, *30*(2), 77–87. https://doi.org/10.1080/08989621.2021.1963708

Peterson, L., & Peterson, M. J. (1959). Short-term retention of individual verbal items. *Journal of Experimental Psychology*, *58*(3), 193–198. https://doi.org/10.1037/h0049234

Phelps, E. A., Berkman, E. T., & Gazzaniga, M. S. (2022). *Psychological science* (7th ed.). W. W. Norton & Company.

Rabin, D. (2016). Presentiment. In *Psi encyclopedia*. Society for Psychical Research. https://psi-encyclopedia.spr.ac.uk/articles/presentiment

Rabeyron, T. (2020). Why most research findings about psi are false: The replicability crisis, the psi paradox and the myth of Sisyphus. *Frontiers in Psychology*, *11*, 562992. https://doi.org/10.3389/fpsyg.2020.562992

Rathus, S. A., Veenvliet, S. G., & Maheu, S. J. (2017). *Psych: Introduction to psychology*. Cengage Learning.

Reber, J. S., Slife, B. D., & Downs, S. D. (2012). A tale of two theistic studies: Illustrations and evaluation of a potential program of theistic psychological research. *Research in the Social Scientific Study of Religion*, *23*, 191–212. https://doi.org/10.1163/9789004242870_012

Rosenhan, D. L. (1973). On being sane in insane places. *Science*, *179*(4070), 250–258. https://doi.org/10.1126/science.179.4070.250

Ruscio, J. (2006). *Critical thinking in psychology: Separating sense from nonsense* (2nd ed.). Cengage Learning.

Savic, I., Berglund, H., & Lindstrom, P. (2005). Brain response to putative pheromones in homosexual men. *Proceedings of the National Academy of Sciences of the United States of America*, *102*(20), 7356–7361. https://doi.org/10.1073/pnas.0407998102

Scargle, J. D. (2000). Publication bias: The "file-drawer" problem in scientific inference. *Journal of Scientific Exploration*, *14*(1), 91–106.

Schacter, D. L., Nock, M. K., & Wegner, D. M. (2018). *Psychology* (4th ed.). Worth Publishers.

Schacter, D. L., Gilbert, D. T., Nock, M. K., & Wegner, D. M. (2020). *Psychology* (5th ed.). Worth Publishers.

Schmidt, S. (2009). Shall we really do it again? The powerful concept of replication is neglected in the social sciences. *Review of General Psychology*, *13*(2), 90–100. https://doi.org/10.1037/a0015108

Sheldrake, R. (1998). Experimenter effects in scientific research: How widely are they neglected? *Journal of Scientific Exploration*, *12*(1), 73–78.

Shrout, P. E., & Rodgers, J. L. (2018). Psychology, science, and knowledge construction: Broadening perspectives from the replication crisis. *Annual Review of Psychology*, *69*, 487–510. https://doi.org/10.1146/annurev-psych-122216-011845

Simons, D. J. (2014). The value of direct replication. *Perspectives on Psychological Science*, *9*(1), 76–80. https://doi.org/10.1177/1745691613514755

Slife, B. D., & Reber, J. S. (2009). Is there a pervasive implicit bias against theism in psychology? *Journal of Theoretical and Philosophical Psychology*, *29*(2), 63–79. https://doi.org/10.1037/a0015151

Slife, B. D., & Reber, J. S. (2021). Against methodological confinement: Toward a pluralism of methods and interpretations. *Psychology of Religion and Spirituality*, *13*(1), 14–18. https://doi.org/10.1037/rel0000256

Slife, B. D., Reber, J. S., & Richardson, F. C. (Eds.). (2005). *Critical thinking about psychology: Hidden assumptions and plausible alternatives*. American Psychological Association. https://doi.org/10.1037/10885-000

Stanovich, K. E. (2007). *How to think straight about psychology*. Allyn & Bacon.

Sternberg, R. J., & Halpern, D. F. (Eds.). (2020). *Critical thinking in psychology* (2nd ed.). Cambridge University Press. https://doi.org/10.1017/9781108684354

Stevenson, I. (1999). What are the irreducible elements of the scientific enterprise? *Journal of Scientific Exploration*, *13*(2), 257–270.

Sturrock, P. A. (1994). Applied scientific inference. *Journal of Scientific Exploration*, *8*(4), 491–508.

Tolman, E. C., & Honzik, C. H. (1930). Introduction and removal of reward and maze performance in rats. *University of California Publications in Psychology*, *4*, 257–275. https://psycnet.apa.org/record/1931-02280-001

Trahan, L. H., Stuebing, K. K., Fletcher, J. M., & Hiscock, M. (2014). The Flynn effect: A meta-analysis. *Psychological Bulletin*, *140*(5), 1332–1360. https://doi.org/10.1037/a0037173

Tressoldi, P. E. (2011). Extraordinary claims require extraordinary evidence: The case of non-local perception, a classical and Bayesian review of evidences. *Frontiers in Psychology*, *2*, 117. https://doi.org/10.3389/fpsyg.2011.00117

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, *5*(2), 207–232. https://doi.org/10.1016/0010-0285(73)90033-9

Wade, C., Taris, C., Somers, S., & Shin, L. (2017). *Invitation to psychology* (7th ed.). Pearson.

Wade, C., Taris, C., Somers, S., & Shin, L. (2020). *Invitation to psychology* (8th ed.). Pearson.

Wagge, J. R., Brandt, M. J., Lazarevic, L. B., Legate, N., Christopherson, C., Wiggins, B., & Grahe, J. E. (2019). Publishing research with undergraduate students via replication work: The Collaborative Replications and Education Project. *Frontiers in Psychology*, *10*, 247. https://doi.org/10.3389/fpsyg.2019.00247

Warne, R. T., Astle, M. C., & Hill, J. C. (2018). What do undergraduates learn about human intelligence? An analysis of introductory psychology textbooks. *Archives of Scientific Psychology*, *6*(1), 32–50. https://doi.org/10.1037/arc0000038

Watson, J. B., & Rayner, R. (1920). Conditioned emotional reactions. *Journal of Experimental Psychology*, *3*(1), 1–14. https://doi.org/10.1037/h0069608

Weiten, W. (2017). *Psychology: Themes and variations* (10th ed.). Cengage Learning.

Wiggins, B. J., & Christopherson, C. D. (2019). The replication crisis in psychology: An overview for theoretical and philosophical psychology. *Journal of Theoretical and Philosophical Psychology*, *39*(4), 202–217. https://doi.org/10.1037/teo0000137

Youyou, W., Yang, Y., & Uzzi, B. (2023). A discipline-wide investigation of the replicability of psychology papers over the past two decades. *Proceedings of the National Academy of Sciences of the United States of America*, *120*(6), e2208863120. https://doi.org/10.1073/pnas.2208863120

Zientek, L. R., Werner, J. M., Campuzano, M. V., & Nimon, K. (2018). Writer's forum: The use of Google Scholar for research and research dissemination. *New Horizons in Adult Education and Human Resource Development*, *30*(1), 39–46. https://doi.org/10.1002/nha3.20209

Journal of Scientific Exploration
Anomalistics and Frontier Science

RESEARCH ARTICLE

Lucid awareness in nonresponsive patients: A "locked-in experience" and its implications

Michael Nahm[1]
nahm@igpp.de
Madelaine Lawrence[2]
Pim van Lommel[3]
Shirly Alon Konichezky[4]
Einat-Hana Shamir[5]

[1]Institute for Frontier Areas of Psychology and Mental Health, Wilhelmstrasse 3a, 79098 Freiburg, Germany

[2]RnCeus Interactive, 2583 Kingsfield Street, Mount Pleasant, SC, USA

[3]Rijnstate Hospital, Cardiology Department, Arnhem, The Netherlands

[4]Department of Medical Psychology, Academic College of Ashkelon, Israel

[5]Emma Productions, 9 Eli Cohen St., Tel-Aviv 6963005, Israel

SUBMITTED November 22, 2024
ACCEPTED February 11, 2025
PUBLISHED October 15, 2025

https://doi.org/10.31275/20253597

PLATINUM OPEN ACCESS

ABSTRACT

It is generally assumed that nonresponsive people in comatose states are unconscious, especially when it is known that their neuronal circuits are not functioning normally, for example, due to severe anoxia and medically induced comas. Nevertheless, occasional reports suggest that sometimes, patients in such conditions can be fully aware of everything that happens around them. The present publication introduces a well-documented case of this kind. It concerns a patient in Israel who was diagnosed with cerebral edema and suffered severe anoxic brain damage that had already affected his brain stem. He was put in an induced coma to minimize the brain's oxygen consumption. Still, he was expected to die within hours. However, the patient recovered unexpectedly. It turned out he had been fully conscious throughout the 44 hours he was in this coma. As a result, he was able to describe in detail every occurrence and conversation that had been held at his bedside throughout this time. This locked-in experience had an utterly traumatic impact on the patient. As a result, practices for coma patient care have been adapted and improved in Israel. We argue that it is important to raise awareness regarding the occurrence of such "paradoxical awareness" and hope that this increased recognition will help to improve the practices for coma patient care, also in other countries. Moreover, such individual case studies are vital for advancing the knowledge about the brain conditions under which it is possible to be aware – a largely neglected field of research that may have further important implications, for instance, in the context of organ donation.

KEYWORDS

Awareness during coma, ICU healthcare, locked-in experiences, near-death experiences, trauma.

INTRODUCTION

In the clinical context of coma patient care, consciousness is defined as "the state of full awareness of the self and one's relationship to the environment" (Posner et al., 2019, p. 3). This definition allows for patients being conscious albeit their body might be nonresponsive. In coma patient care, the potential degree of their consciousness is assessed operationally at the bedside by their responses to standardized tests. Testing of consciousness by staff usually involves eliciting physical responses such as what is outlined in the Glasgow Coma Scale (GCS) and the Full Outline of

UnResponsiveness coma scale (FOUR), which include eye response to minor uncomfortable stimuli, verbal responses to questions, motor responses to body pressures, and respiratory responses (Mehta & Chinthapalli, 2019; Iyer et al., 2009). These tests are important tools to identify levels of coma from the outside perspective, but they cannot detect awareness in patients who can understand what is being said at their bedside but cannot move. Until today, only comparably few prospective studies have been performed to systematically address experiences reported by people who had been unconscious or in a coma and regained their consciousness. Most of these studies were conducted in the context of research into near-death experiences (NDEs; e.g., Holden, 2009; Hou et al., 2013; van Lommel et al., 2001; Parnia et al., 2001, 2023; Rousseau et al., 2023; Sabom, 1982; Sartori, 2008; Schwaninger et al., 2002; Yamamura, 1998). Often, the focus of these investigations was to detect indications of veridical perception of events or targets in the physical environment from the perspective of out-of-body experiences (OBEs) during NDEs, and/or the experiences of patients scoring lower than the cut-off score of ≥ 7/32 for NDEs on the NDE scale (Greyson, 1983, 1990) have not been considered further. Consequently, the full spectrum of experiences reported from periods of unconsciousness is still largely unknown and under-researched. It is obvious, however, that NDEs, including OBEs, represent only a small part of the spectrum of experiences reported from states of temporary unconsciousness.

According to results of a few pioneering, more encompassing studies, 25 to 40% of patients who had been in an unresponsive state were able to hear and understand what had been said in their environment during the time of their supposed unconsciousness (Lawrence et al., 2023). One systematic survey of 100 hospital patients who were once documented to be unconscious and recovered attempted to identify all the experiences patients had during their state of apparent unconsciousness, not only NDEs (Lawrence, 1995, 1997). Of the 100 patients, only 27 had no recollection of an experience. The other patients reported different kinds of experiences that were classified as "inner consciousness" (no awareness of the external environment but an awareness of inner self; 9 persons), "perceived unconsciousness" (ability to hear, understand, and respond emotionally to what was being said but unable to respond physically or communicate; 27 persons), "distorted consciousness" (distortions of perception, memory, or personality; 14 persons), and "paranormal experiences" (out-of-body experiences, pleasurable and distressing NDEs, end-of-life visions; 23 persons). Two or more of these experiences can also occur successively during a phase of apparent unconsciousness in the same person. Different kinds of experiences reported by cardiac survivors have also been described in a recent study, some of them being described as very distressing (Parnia, 2023).

In a recent book devoted specifically to experiences reported by patients who recovered from medically induced comas, the authors problematized several aspects of these states (Pearce & Pearce, 2024). The focus of this treatise rests on deeply traumatizing and unforgettable experiences that are usually subsumed under the term and concept of "ICU delirium." However, systematic studies into the contents of ICU delirium and/or coma experiences are still needed, and there are indications that their variety and experiential depth have largely been underestimated in the medical setting. For example, the patients may have experienced being cruelly tortured for prolonged periods of time or may have spent years from a subjective perspective in seemingly other realms of existence – even if the coma itself lasted only days or weeks. These bewildering experiences frequently appear perfectly real or even "more real than real" to those who report them (Pearce & Pearce, 2024).

This experiential attribute is untypical for delirium, which is rather defined as a fluctuating disturbance in attention (e.g., reduced ability to focus and sustain attention) plus additional disturbance in cognition (e.g., memory deficit, disorientation, perceptual disturbance; American Psychiatric Association, 2022). However, such an unusual experiential depth is well-known from the spectrum of NDEs. Hence, some of these experiences might rather be regarded as instances of profoundly distressing NDEs in the classification of Lawrence (1995) rather than instances of mere delirium (for an overview on distressing NDEs, see Greyson, 2023; for an earlier monograph, see Bush, 2012).

Experiences according to which comatose patients were fully aware inside their body but unable to communicate or move in any way (Lawrence, 1995) continue to be reported as well (Kerkhoffs, 1994; Levy, 2015; Morales, 2008; Orange, 2014; Pearce & Pearce, 2024). Elsewhere, one of us (MN) has described the case of a woman in a hospice who unexpectedly woke up from a coma after two and a half months (Nahm, 2013). She had been transferred to the hospice from a hospital after an EEG recorded no cortical activity. Hence, she was considered to be entirely unconscious. Further attempts to monitor her brain via EEG

had not been performed in the hospice, however. After she awoke, it turned out that she had overheard emotional private conversations the caretakers shared between themselves at her bedside, being lucidly aware. She remained conscious and died about four months later. Similarly, the case of "Juan" described by Adrian Owen (2017) concerns a patient who awoke unexpectedly from a very deep coma. He had obviously been fully conscious even during the time his brain activities were examined twice by Owen's team in an fMRI scanner, and the scans showed no signs of coherent consciousness and cognition.

It is, in fact, known already for a long time that comatose patients can sometimes hear and understand what goes on around them. Hence, although systematic studies to assess this peculiar phenomenon are largely lacking, guidelines for coma patient care often include the recommendation that caregivers should behave as if the patients were conscious, e.g., by always talking as if the patients can hear and understand what is being said (Lawrence et al., 2023). However, as the above-described example of the comatose woman in the hospice shows, these recommendations are not always kept. This may in part be due to the assumption that the presence of a conscious mind requires intact cortical functions, as in instances of the medical condition known as the "locked-in syndrome." Here, a patient may be conscious but unable to respond to stimuli because of paralysis of all four limbs and the lower cranial nerves (Posner et al., 2019, p. 6).

The locked-in syndrome is typically caused by brainstem pathology, while cortical functions remain intact and functional (Das et al., 2024). But in case cortical functions are known to be severely impaired according to EEG recordings or brain scans, and it is furthermore expected that these functions will not improve again, one might infer that the patient is definitively unconscious and behave accordingly, thereby neglecting existing recommendations for coma patient care. However, there is growing evidence that unresponsive patients with severe brain injuries may perform cognitive tasks that are detectable via EEG and fMRI (Lawrence et al., 2023). A recent study detected such responses to cognitive tasks in 60 of 241 patients (25%) who were otherwise unable to show signs of cognition (Bodien et al., 2024). This confirms the findings mentioned earlier, according to which 25 to 40% of patients who had been in a nonresponsive state but recovered reported they were able to hear and understand what had been said at their bedside (Lawrence et al., 2023).

In any case, being lucidly aware inside a nonresponsive body can be deeply traumatizing for people in such a state on a general level. Because the entire field of coma experiences is under-researched, there is a pressing need to investigate the spectrum of the different kinds of coma experiences and to raise the awareness about them in order to improve important practical aspects of coma patient care (Lawrence et al., 2023; see also the online training course about experiences of unconscious patients for nurses, Lawrence, n.d.).

In the present publication, we provide a contribution to the study of coma experiences. We present the case of a coma patient who was lucidly aware throughout the 44 hours he spent in a medically induced coma after suffering acute oxygen starvation that already affected the brain stem. It concerns a previously healthy man of 33 years, Gil Avni. The coma was induced because he suffered a sudden respiratory failure of unknown origin that was thought to result in severe anoxic brain damage. However, Avni could recall the events that happened at his bedside with perfect accuracy. Being conscious but completely paralyzed throughout this time was a traumatizing experience for Avni. In order to refer to this state from the experiential first-person perspective, we term it a "locked-in experience." His case has already been covered in the extensive documentary film "44 Hours" that was produced by Einat-Hana Shamir and directed by Rotem Gross (Gross & Shamir, 2022). By presenting and discussing it in this paper, we follow two main aims:

1. We provide a review of Avni's locked-in experience, demonstrating that he retained his full lucid awareness and was able to memorize everything that occurred throughout his utterly precarious and seemingly unconscious state. We discuss the implications of his case for consciousness studies.
2. As a means to cope with his traumatic experience, Avni started to inform healthcare professionals and the public about what happened to him. His activities have already led to the adaptation and improvement of coma patient care in Israel. Assuming that other comatose patients who are considered to be unconscious might, in fact, be fully conscious, we hope that making his case better known also outside of Israel will raise awareness regarding the occurrence of such paradoxical states of consciousness and stimulate the adaptation of guidelines for the treatment of coma patients also in other countries.

Below, we provide a concise overview of Avni's case. First, we describe the events concerning his health crisis from an outside perspective. Thereafter, we describe these events from the inner subjective perspective as experienced and reported by Avni. Both perspectives are covered in the documentary on his case (Gross & Shamir, 2022), and we add some additional medical and experiential details not contained in this documentary. This chiefly concerns OBEs and spiritual elements of Avni's experience. Earlier, he was reluctant to share these episodes publicly because of the fear of being ridiculed. In accordance with this, and in order to achieve the maximum practical impact in the medical community, the team creating the documentary decided to focus on the fact that Avni was continuously conscious and not to include potentially distracting and controversial elements. In the Discussion section, we put Avni's experience in the context of other cases and highlight their implications for medical practice and consciousness research.

CASE REPORT

The External Course of Events

On the evening of Thursday, December 17, 2015, Gil Avni watched a sports event on TV at home in the living room. His two young children were sleeping already, and his wife, a hospital nurse by profession, went out for the evening at about 8:15 p.m. When she returned home at about 0:30 a.m., she found Avni on the sofa in front of the TV in an alarming condition. He was "cyanotic" (the skin had a bluish-purple hue due to prolonged deficient oxygenation of the red blood cells), had a respiratory rate of 50 breaths per minute, and slipped in and out of consciousness in a highly confused state. When emergency medical services arrived, the pulsoxymetrically measured oxygen saturation in his blood was determined to be around 50%, sometimes even lower (normal values are 95% or higher). Avni's pulse frequency oscillated between 180 and 200 beats per minute. He was put on a stretcher and immediately driven to the trauma room of a hospital. After arrival, his blood oxygen saturation was still 50%, and he was still cyanotic despite being ventilated with a bag valve mask. Again, he was confused, slipped in and out of consciousness, and was sometimes agitated. At one point, he threw up, and stomach acid entered his lungs. This complicated and hindered the oxygenation process, thus increasing the risk of brain damage due to prolonged severe oxygen deficiency. In order to sedate him and minimize the oxygen consumption of his brain, Avni was put into a medically induced coma. He received Propofol, Ultiva, and Dormicum and was then intubated with an endotracheal tube to ensure oxygen supply and put on ventilation. Nevertheless, his lungs started to develop aspiration pneumonia due to the inhaled vomit.

When the physicians checked Avni's eyes, they noted that one of his pupils was dilated and unresponsive to light stimuli, suggesting a neurological condition in the brain stem probably caused by mechanical compression. He was rushed to the CT scanner. The scans indicated the presence of cerebral edema, although its extent remained unclear. The oculocephalic reflex ("doll's eyes reflex") was negative, thus confirming severe brain stem dysfunction. The overall diagnosis of his brain state was "anoxic brain damage." After the scans, it remained impossible to stabilize Avni's condition. All treatments failed. His life was considered to be critically endangered by the attending physicians. One of them urged Avni's wife to call Avni's parents, as he suspected that he would not survive the next four hours until morning. However, she refused to call them, fearing that their fragile health would suffer too much when being woken up in the night with this kind of information.

When the Friday morning shift arrived, the situation was basically unchanged. The oxygen saturation of Avni's blood was only around 70%, and the pulse frequency was about 200 beats per minute. A vast array of treatments and medications had already been tested, but nothing had a positive effect on his condition. His brain was considered to be irreversibly damaged.

In the meantime, his wife had called and informed his parents about their son's state of health. Soon after, in the morning, visits of people who came to say their last goodbye to Avni commenced. All in all, 17 visitors arrived. Apart from his wife and parents, they included his sister as well as other relatives, friends, and colleagues from work. It was the general consensus that it would be unlikely that he survived his malady – and that if he survived, he would not be the same person anymore because of the suspected brain damage that most likely had already been occurring.

A few hours later in the evening, Avni's body started to move and shake in a seemingly spastic manner. As a result, the medical devices he was hooked to went into alarm mode and started beeping. The ICU nurse in charge became very nervous, shouted "We are losing him!" and called for a physician. They decided to increase the amount of anesthetics to prevent further spastic movements and immobilize Avni's muscles.

On Saturday morning, his parents and wife visited him again in the hospital. His father-in-law and brother-in-law came as well. Avni's condition had not changed much. Later in the afternoon, a physician checked his eyes and noted that one pupil was still dilated. However, two attending physicians had different opinions concerning his state. One physician thought that it was too early to conclude that Avni would be retarded or in a vegetative state if he continued to live. The other physician thought it was virtually certain that he must have severe brain damage by now and that they should wait another 72 hours and then try to wake him up to determine the degree of this damage. Participating in this discussion at Avni's bedside, his wife realized that tears ran from his eyes. She concluded that he must be listening to this discussion as well.

As a result, it was later decided that the night shift personnel would try to wake him up after his wife and parents left. In the evening, the anesthetic medication was therefore decreased, and Avni was repeatedly asked to move his eyes. At one point, the Senior ICU nurse indeed noticed a slight movement of his pupils that followed her instructions. The procedure to wake Avni up was continued. Not long after, he woke up completely, and to the surprise of everybody, all critical symptoms, including pulse and blood pressure, rapidly returned to normal. In order to facilitate communication with him (he was still weak and intubated), the nurse handed him a letter board as well as sheets of paper and a pen. One of the first things Avni communicated was: "I was in full consciousness since Thursday evening. I heard everything they said, word for word."

On Sunday morning, the endotracheal tube and other medical devices were removed. Soon after, Avni left the hospital on his own account. To this day, none of the physicians and ICU nurses involved in Avni's case has a medical explanation for his sudden and dramatic life-threatening breakdown – much less for his prompt recovery to full health. Only the aspiration pneumonia improved comparably slowly. It took three months until Avni's lungs were healthy again.

The Personal Experience of These Events by Gil Avni

The most intriguing aspect of this episode, however, is Avni's personal experience of these events. The last thing he remembers from being at home is that he was watching a commercial break on the TV in his living room. He became particularly intrigued by an advertisement for a TV film about doctors; it seemed like a documentary: Four people were running frantically with a man on a stretcher through the floors of a hospital towards a room. Avni heard no sounds but perceived the scenery only visually. The doors were open, and other people were already waiting for this man to arrive. On the right side of this room lay another man who was apparently in a bad state of health. The man on the stretcher was then surrounded by people. Two doctors now stood over him. Suddenly, Avni recognized that this man was wearing his (Avni's) trousers. He concluded that the man who had been rushed into this emergency room on the stretcher must, therefore, be himself. Once he realized this, the perspective shifted, and he was also able to hear again. Avni saw these two doctors now from an embodied perspective, leaning over him and facing him. He realized that the medical staff around him was in complete panic. He also felt a strong pressure in his chest region, and he then threw up, smudging one of the two doctors. Thereafter, Avni was anesthetized and intubated. One doctor shut and glued his eyelids to save the cornea from dehydration. From then on, he followed the events that occurred during the next two days chiefly via his sense of hearing from this in-the-body perspective, although he also experienced occasional OBEs again, during which he seemed to perceive his environment visually.

Typically, Avni entered the OBE-state in particularly distressing and emotionally intense situations. This happened, for example, when the visitors came to say their goodbyes. In this situation, he was able to perceive them visually and memorize the clothes they wore. He even saw his sister, who had to wait in a corridor of the hospital about 30 to 40m from his room. She was not allowed to visit Avni at his bedside because she was pregnant and he was treated with nitric oxide, a substance that may cause harm to developing fetuses. Still, Avni saw her (crying) and followed the conversations she led, e.g., with her husband, and was later able to describe her clothing. In discussions with Avni, his sister, and other visitors, members of the team producing the documentary were able to corroborate that he had described the events that occurred accurately and gave correct descriptions of their clothes (of the authors of this article, the team members include E.-H. S. and S. A. K.).

Other elements that link his case to NDEs include the perception of an attractive, bright, whitish light. He perceived it in the OBE state in the distance when he was initially transported through the hospital corridors into the room where he was to be put into the coma. But Avni did not want to get closer to this light. Moreover, he felt the

distinct presence of a spiritual entity throughout the entire time he was in the coma. When he was in the OBE state, he could even perceive it as a shadow-like figure inside his room. Apparently, this entity was already present when he arrived in the hospital room and stayed with him until the decision was made to wake him up from the coma. Throughout that time, it encouraged Avni to stay alert and awake, and not to give up hope for recovery. According to Avni, who regards this entity as a kind of guardian angel, it approached him and touched him with a finger after the decision to wake him up was made. This touch felt like a tremendous jolt of electricity-like energy, and the being informed him that it was now time to leave him because its duty was fulfilled.

In any case, throughout the entire time Avni was thought to be unaware, he remained fully conscious. He followed and remembered everything that happened around him. That included every conversation held in the vicinity of his bed by anesthesiologists, neurologists, nurses, family members, friends, etc. He even heard and remembered the squeaking sound of the bed on which he was transported to the CT scanner. When he heard the doctors discussing his suspected cerebral edema and the potential brain damage, he tried to intervene, stressing that his mind was fully intact, but he could not let them know.

Not knowing what had actually happened and how he arrived in this situation, Avni realized that it would be very important to remember everything that had been said next to him. He started to purposefully memorize everything, all that he heard. He is convinced that this purposeful memorizing of all acoustic perceptions is one factor that kept him together and helped him to stand this utterly horrible experience. As demonstrated in the documentary film, Avni was very successful in memorizing what happened and what had been said. He accurately remembered virtually everything that the various doctors and nurses said in their different shifts, be it addressed to him or at each other. He was greatly relieved when he heard how and why he arrived in his present situation when the Thursday night shift informed their successors on Friday morning about what happened to this patient. Only then did Avni learn that he had collapsed on the sofa at home while watching TV, that his wife had found him, and that he had been rushed to the hospital with emergency medical services. Moreover, he remembered everything that the numerous visitors who came to bid him a last farewell spoke at his bedside.

A particularly important episode occurred on Friday evening, the second day he was unconscious. For some reason, Avni suddenly sensed a tingling feeling in one of his feet. He decided to take all his forces together in order to kick with this leg to demonstrate to the attending ICU nurse that he was awake inside, not unconscious. Although Avni was not feeling his entire body, he still had the impression that he was kicking successfully with his leg. Indeed, the nurse noticed movements – not only in his leg but all over Avni's body. As described earlier, the medical devices he was connected to went into alarm mode, the nurse became extremely nervous and shouted, "We are losing him!" This unexpected stressful development of the events greatly alarmed Avni himself, which led to another brief OBE during which he could perceive his environment, including the nurse, the monitors of the medical apparatuses, and the physician entering his room. However, his consciousness soon slipped into the body again, and he was only able to follow what happened acoustically. Avni overheard the conversation between the nurse and the physician, who then increased the anesthetic medication in order to avoid further spastic movements. Within 10 seconds, the slight tingling sensation Avni felt in his foot disappeared. This failure to alert the nurse's attention regarding his true state and the renewed loss of any capacity to move his body was one of the most desperate episodes during his time of supposed unconsciousness.

Similarly, when the nurse tried to wake Avni up and he did not succeed in moving his eyes at first, he became desperate. As soon as he was finally able to communicate, he was immensely relieved and urgently longed to talk about his experiences, informing people he was OK and that he had been fully conscious all the time. This is why he immediately wrote about his experience after the nurse gave him the papers and the pen.

Figure 1 shows a timeline depicting important events that occurred from Thursday evening, when Avni suffered his respiratory failure, to Sunday morning, when he left the hospital again.

All in all, these experiences had been utterly traumatic for Avni. He virtually felt trapped inside his body and feared that, in the worst case, he would have to spend a very long time, perhaps years or the rest of his life, in this unbearable state of existence. For several months after he recovered, Avni had nightmares, sometimes each night, waking up screaming and sweating profusely. Because he was afraid of returning back into a state in which his body was "sleeping" while his mind was fully awake, he feared falling

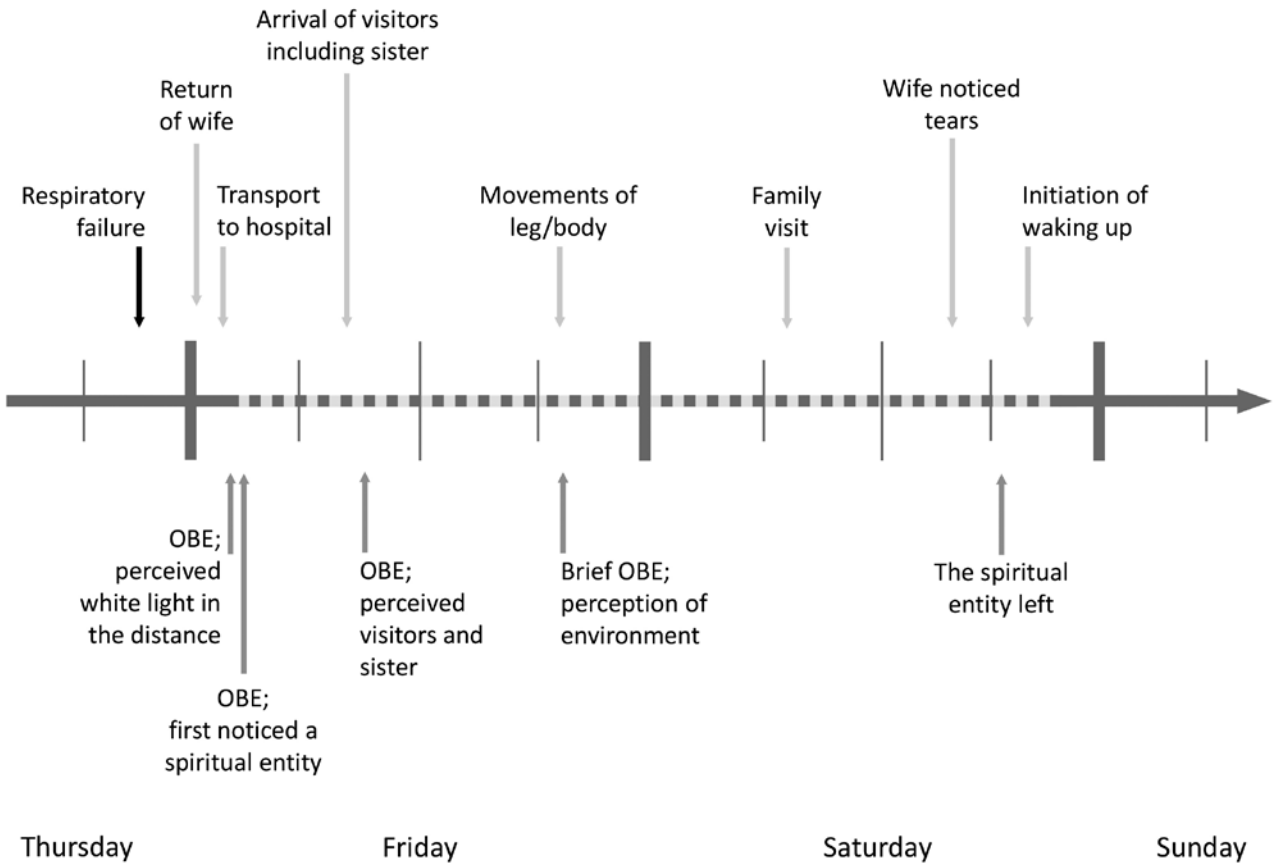


Figure 1. Graphical illustration of important events along the timeline of Gil Avni's coma experience. The time span shown runs from Thursday evening (December 17, 2015) until Sunday morning. Days are separated by thick gray vertical lines. The thin gray vertical lines indicate time intervals of six hours, the longer ones representing noon. The dotted area within the horizontal line indicates the time Avni spent in a coma, but was fully conscious. The occurrences of externally observable events are depicted above this line; personal experiences of Avni are depicted below it.

asleep at night. As a result, Avni barely slept for two years. Similarly, he feared that a similar incident of unexplained respiratory failure might happen again. Episodes in which he is emotionally troubled by his locked-in experience still come and go.

For Avni, one way to cope with this distressing coma experience consisted of informing other people about it, trying to raise awareness of such occurrences in order to help others who might be in a similar situation. He considers this activity and attempts to help others to be part of his recovery process. Even today, Avni remembers the events that occurred during the 44 hours he spent in this coma with vivid clarity. However, he did not have noteworthy or clear memories concerning the events that occurred in his living room at home, during which he seemed to be confused and agitated, slipping in and out of consciousness. Regarding the first occurrences in the hospital, Avni only remembers observing the events from a detached external perspective, watching the physicians working on an apparently sick and confused patient whom he did not even identify as himself.

DISCUSSION

The case of Gil Avni is remarkable for a number of reasons. Because the producers of the documentary movie interviewed numerous witnesses, it was possible to positively ascertain that he indeed remembered everything that happened in the course of his 44-hour-long coma correctly. In addition to the medical personnel of the changing shift teams in the hospital, many of the 17 private visitors at his bedside confirmed that what Avni reported about the conversations and occurrences in the hospital was perfectly accurate, including his description of the clothes they wore. He was conscious and lived through a terrifying locked-in experience when everybody thought his brain condition

would definitively exclude this possibility. In addition to the suspected cerebral edema that was thought to have caused irreversible anoxic damage of his cortical functions and the brain stem, Avni was put into an induced coma to minimize his brain's activities and oxygen consumption. When brain activities during medically induced comas are monitored via EEGs, they typically display a pattern known as "burst suppression" (San-juan et al., 2010; Shanker et al., 2021). This pattern is considered to be an indicator of extremely low brain activity, and it is generally assumed that it is impossible to be continuously and coherently conscious when the brain shows this activity pattern. In very deep induced comas, the cortical brain regions can become even less active and display an isoelectric "flatline" in EEG recordings. It would be very interesting to know what EEG patterns Avni's brain displayed during his coma, but EEG measures had not been employed in his case.

However, as a result of discussions with Avni and his activities to raise awareness regarding such locked-in experiences in comas in order to reduce the frequency of their occurrence in the future, the medical staff of several hospitals in Israel has revised and adapted their practices for coma patient care. Many nurses have, in fact, been eager to improve and change aspects of their work after having followed a mere routine for years. This includes the recommendation that brain activities of comatose patients in ICU rooms are monitored via EEG devices. Should their recordings show signs of brain activity indicative of consciousness, the medical staff should initiate attempts to wake patients up. Some hospitals in Israel have already installed EEGs in ICU rooms. The improvements of previous practices for coma patient care for physicians and nurses in ICU rooms furthermore include the following:

- When handling comatose patients, they must be addressed in person and by their first name.
- Add a photo of the comatose patient from a time they were healthy to the medical map in order to remember that this unresponsive person is an individual with a colorful life history and social relations.
- The medical team must not make casual remarks on the patient's health or discuss the patient's condition between themselves and with visitors at the patient's bed.
- Nevertheless, medical diagnoses are carefully explained and actively shared with patients.
- Medical teams inform and update the patients' families regarding their condition and medical procedures in a neutral setting, not at the patients' beds.
- Depending on the individual condition of the patients, attempts to wake anesthetized patients up are made more frequently than before, ideally every four hours.
- Hospital staff and visitors must not hold private conversations about personal matters next to patients in ICU rooms.
- The limbs of anesthetized and ventilated patients are not to be fixed to their beds.

Recommendations for visitors of patients include the following:

- Convey hope and a positive atmosphere around the patient.
- Play music the patient likes.
- Inform the patient about topics of their interest (hobbies, sports, leisure activities) and update them regarding current events (family, friends, business).
- Bring the patient scents related to their home or loved ones (a beloved dog's collar, a significant other's perfume or cologne, their mother's cooking, etc.).
- If appropriate, try alternative treatment methods such as guided meditation.

These improvements are merely performed by hospital staff in Israel as a result of being familiar with Gil's case. They have not yet found their way in printed versions of coma care guidelines. Therefore, we recommend including these improvements in printed guidelines and literature on coma patient care in Israel and other countries.

A further recommendation is to regularly move the body or limbs of seemingly unconscious patients since sensory stimulation of this kind might increase their awareness (Lawrence et al., 2023) or help them to show signs of awareness by subtly reacting while being moved. For the nurse who awoke Avni from his coma, slight resistance to bodily movements provided an indication that Avni might indeed be conscious.

It is also important to apply these improved practice methods not only to patients in medically induced comas, but also to patients who slipped into a nonresponsive state because of fatal diseases and natural causes such as accidents, cardiac arrest, or suffocation (e.g., Levy, 2015; Morales, 2008; Orange, 2014). For example, we know of another case in Israel in which somebody suffocated due to

a natural cause and seemingly fell unconscious. However, also this person, at that time a 13-year-old boy, remained fully conscious and followed everything that happened on his way to the hospital and in the hospital acoustically from an in-the-body perspective. When he arrived there, his heart had already stopped beating, and his skin was cyanotic. A physician performed a tracheostomy, and he was finally resuscitated. Also, for this boy, being lucidly awake throughout this time inside a nonresponsive body was an utterly traumatic experience. Today, he is a retired professor. His locked-in experience occurred 66 years ago, and he still remembers it very vividly and intensely.

From the related context of studies into NDEs, it is in fact well established that people who appear to be unconscious for whatever reason can still be conscious and live through profound and often life-changing experiences. Although NDErs more typically report having observed the occurrences from an out-of-the-body perspective rather than from an inside perspective, these experiences can dramatically impact those who experience them. But because Avni's experience also included OBEs and spiritual elements, just as in more typical NDEs, the following example of an NDE resembles Avni's case in important respects (Sartori, 2008; Sartori et al., 2006): A 60-year-old patient collapsed in a hospital. His oxygen saturation dropped, he was ventilated with an Ambu bag, and a light that a physician shone into his eyes showed that the pupils reacted unevenly, one was larger. After more efforts to save and stabilize the patient, he regained consciousness about three hours after his collapse. As soon as he could, he excitedly tried to communicate something to the physicians, but could not do so because he was still being ventilated. As in Avni's case, he was given a letter board. He spelled out: "I died and I watched it all from above." Due to his OBE, he was furthermore able to provide veridical descriptions of occurrences that happened around his bedside during the time he had seemingly been unconscious.

In numerous other cases, patients provided similar veridical descriptions of occurrences around their bedside even after their hearts had stopped beating, sometimes for more than ten minutes (Holden, 2009; Rivas et al., 2023; van Lommel et al., 2001). However, according to current models of brain functioning, perceiving the environment and remembering everything correctly should not be possible under conditions of severe oxygen deprivation and brain malfunctioning. Several authors, therefore, suggested that in such cases, these experiences did not take place in real-time. Rather, they would be a reconstruction in which stimuli subconsciously received in the past had been amalgamated into a hallucination-like OBE during the time when the patients' brains were already recovering again. The impression that these OBEs and NDEs had been made in real-time would be erroneous (e.g., Marsh, 2010; Mitchell-Yellin & Fischer, 2014). For a number of reasons, however, this neurophysiological reconstruction model is faced with conceptual difficulties and empirical evidence that contradicts some of its corollaries (Nahm & Weibel, 2020).

In this context, the case of Gil Avni also contributes to the theoretical aspects of consciousness studies. It is well established that he followed the events in his surroundings in real-time during his coma, at times even from an OBE-perspective. This is evidenced by his virtually unbroken chain of exact and correct memories concerning the events and conversations held by numerous people at his bedside during the course of 44 hours. His experience furthermore contains objective markers that were observable from an external perspective: His description of the events and conversations surrounding the successful movement of his leg (in fact, body) and the subsequent increase of anesthetic medication perfectly matches the corresponding account of the attending medical staff. Likewise, he cried tears when following the discussion of physicians and his wife about his condition, which they held at his bedside.

Moreover, Avni seemingly never lost consciousness during his coma and remained on a high level of lucid awareness continuously, even during the phase when he was woken up. He remembered the entire procedure and the words that the responsible nurse said during its course. It seems that neither the amount of decreasing anesthetic medication nor that of increasing oxygen in his blood had an impact on Avni's mental state. In sum, there is no indication that his locked-in experience was a hallucination-like construct that was created at the time his brain slowly regained its function as he woke up from an unconscious state, as it is postulated in the neurophysiological reconstruction model. Rather, it is fairly obvious that his experience took place in real time. Much the same applies to the case of the 13-year-old boy described above and "Juan", the comatose patient whose brain activities were studied by Owen (2017) and found to be essentially nonfunctional.

But in contrast to the latter two cases and numerous other reported coma experiences (Lawrence, 1995; Pearce & Pearce, 2024), it is of added interest that Avni's coma

experience contained the already mentioned occasional OBEs and other typical elements reported from NDEs. This overlap of coma experiences and NDEs demonstrates the variability of experiences made in near-death states and thus, the significance of Avni's case for NDE research. His experience provides one more example highlighting that individual case studies can contribute in important ways to advancing our knowledge about the relation of the mind and the brain, or more specifically, about brain conditions under which it is still possible to be lucidly aware (for other examples, see Rivas et al., 2023).

One reason why advancing this knowledge is important concerns the practice of organ donation. Before organs can be explanted from comatose patients, the patients need to be declared "brain dead." Such declarations are obviously a delicate matter and require standardized regulations. But given that there is already a wide heterogeneity among healthcare professionals regarding the clinical definition, diagnosis, and management practices regarding coma (Helbok et al., 2022), it is not surprising that also criteria and practices regarding organ donation differ in different countries and ethical implications of organ donation are discussed controversially (van Veen et al., 2018; Klessig, 2023; Shewmon, 2024). Moreover, the factual practice in hospitals may differ from theoretically prescribed procedures, leading to misdiagnosis (Beckmann, 2023). In fact, there have been numerous comatose patients who recovered after having been considered "brain dead" (Respect for Human Life, 2022) – and to their horror, some of them had even been conscious when the doctors discussed organ donation or the termination of life support at their bedsides (Levy, 2015; Morales, 2008; Orange, 2014). Similarly, it was assumed by some that Avni's brain might be "dead" or dying. His wife, then a hospital nurse familiar with critical patient care, expected that the organ transplant manager would approach her any time to discuss the possibility of organ donation regarding her husband. To her relief, this did not happen. The brains of "brain dead" patients who regained consciousness had obviously not been dead. These patients only had a severe brain failure.

But to learn more about the brain conditions during which it is still possible to be aware, there is an urgent need to perform prospective large-scale studies on coma experiences, also from this perspective. If 25 to 40% of unresponsive patients can show evidence for the performance of cognitive tasks in response to respective requests (Bodien et al., 2024) because they are able to hear (Lawrence et al., 2023), many more unresponsive patients than presently assumed might, in fact, be conscious. Until today, however, the enormous implications for organ donation of lucid awareness, even in unresponsive patients whose brains are deemed to be severely and irreversibly damaged, are barely discussed in the literature on NDEs, coma, or organ donation itself. There are only a few exceptions (van Lommel, 2011; Nahm, 2013).

To conclude, we believe that the case of Avni is important for several reasons:

On a general and theoretical level, Avni's case contributes to advancing our understanding of theoretical models of NDEs because it constitutes one more example that questions the plausibility of the neurophysiological reconstruction model for NDEs and provides added evidence for real-time models.

On the practical level, it contributes to raising awareness about the possibility that comatose patients might be conscious even when the prevailing brain conditions make it seem quite unlikely. Because locked-in experiences can be utterly traumatic for coma patients, recognizing the possibility of what may be called "paradoxical awareness" in comas when brain functions are severely compromised is important in at least three respects:

- It demonstrates the need to revise and improve practical aspects of contemporary coma patient care, as already evidenced by the adaptions of the nursing practices achieved in Israel.
- It demonstrates the need for systematic research into coma states, specifically regarding coma experiences (including "ICU delirium") and their aftereffects in the context of induced comas.
- It demonstrates the need for systematic research into states of unresponsiveness that resulted from diseases and natural causes, including suffocation, cardiac arrest, and accidents, also for advancing the medical and ethical foundations of organ donation.

Such studies could be performed along the lines described in Lawrence et al. (2023). In addition to electrophysiological methods to detect awareness, interviews with previously unconscious patients are highly desirable. The potentially veridical perception of events or targets in the physical environment from an OBE-perspective (Parnia et al., 2023) could be included as a partial research objective as well.

ACKNOWLEDGEMENTS

We are very thankful to Gil Avni for generously sharing his experience and for his support in writing the present publication about this experience and its implications.

REFERENCES

American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders* (5th ed., text rev.; DSM-5-TR). American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890425787

Beckmann, R. (2023). Falsche „Hirntod"-Feststellung in Deutschland. *Medizinrecht, 41*(11), 863–868. https://doi.org/10.1007/s00350-023-6598-2

Bodien, Y. G., Allanson, J., Cardone, P., Bonhomme, A., Carmona, J., Chatelle, C., Chennu, S., Conte, M., Dehaene, S., Finoia, P., Heinonen, G., Hersh, J. E., Kamau, E., Lawrence, P. K., Lupson, V. C., Meydan, A., Rohaut, B., Sanders, W. R., Sitt, J. D., … Schiff, N. D. (2024). Cognitive motor dissociation in disorders of consciousness. *New England Journal of Medicine, 391*(7), 598–608. https://doi.org/10.1056/NEJMoa2400645

Bush, N. E. (2012). *Dancing past the dark: Distressing near-death experiences.* Parson's Porch Books.

Das, J. M., Anosike, K., & Asuncion, R. M. D. (2024). Locked-in syndrome. In *StatPearls.* StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK559026/

Greyson, B. (1983). The near-death experience scale: Construction, reliability, and validity. *Journal of Nervous and Mental Disease, 171*(6), 369–375. https://doi.org/10.1097/00005053-198306000-00007

Greyson, B. (1990). Near-death encounters with and without near-death experiences: Comparative NDE scale profiles. *Journal of Near-Death Studies, 8*(3), 151–161. https://doi.org/10.1007/BF01074000

Greyson, B. (2023). The darker side of near-death experiences. *Journal of Scientific Exploration, 37*(4), 683-698. https://doi.org/10.31275/20232843

Gross, R., & Shamir, E.-H. (2022). *44 hours* [Documentary]. Yes Docu; SWR (Co-Production); Arte (Co-Operation); Keren Makor Foundation. Produced by E.-H. Shamir; directed by R. Gross. Available at www.amazon.com

Helbok, R., Rass, V., Beghi, E., Bodien, Y. G., Citerio, G., Giacino, J. T., Kondziella, D., Mayer, S. A., Menon, D., Sharshar, T., Stevens, R. D., Ulmer, H., Venkatasubba Rao, C. P., Vespa, P., McNett, M., Frontera, J., & the Curing Coma Campaign and its Contributing Members. (2022). The Curing Coma Campaign international survey on coma epidemiology, evaluation, and therapy (COME TOGETHER). *Neurocritical Care, 37*(1), 47–59. https://doi.org/10.1007/s12028-021-01425-8

Holden, J. M. (2009). Veridical perception in near-death experiences. In J. M. Holden, B. Greyson, & D. James (Eds.), *The handbook of near-death experiences: Thirty years of investigation* (pp. 185–211). Praeger/ABC-CLIO. https://doi.org/10.5040/9798400661389.ch-009

Hou, Y., Huang, Q., Prakash, R., & Chaudhury, S. (2013). Infrequent near-death experiences in severe brain injury survivors: A quantitative and qualitative study. *Annals of Indian Academy of Neurology, 16*(1), 75–81. https://doi.org/10.4103/0972-2327.107715

Iyer, V. N., Mandrekar, J. N., Danielson, R. D., Zubkov, A. Y., Elmer, J. L., & Wijdicks, E. F. M. (2009). Validity of the FOUR score coma scale in the medical intensive care unit. *Mayo Clinic Proceedings, 84*(8), 694–701. https://doi.org/10.4065/84.8.694

Kerkhoffs, M. N. (1994). *Droomvlucht in coma.* Marga Genot Melick.

Klessig, H. (2023). *The brain death fallacy.* Independently published.

Lawrence, M. (1995). The unconscious experience. *American Journal of Critical Care, 4*(3), 227–232. https://doi.org/10.4037/ajcc1995.4.3.227

Lawrence, M. (1997). *In a world of their own: Experiencing unconsciousness.* Praeger.

Lawrence, M. (n.d.). Experiences of previously unconscious patients. *Online course about coma experiences for nurses.* https://www.rnceus.com/course_frame.asp?exam_id=15&directory=uncon

Lawrence, M., Ramirez, R. P., & Bauer, P. J. (2023). Communicating with unconscious patients: An overview. *Dimensions of Critical Care Nursing, 42*(1), 3-11. https://doi.org/10.1097/DCC.0000000000000561

Levy, A. (2015, March 16). Coma victim back from the dead after hearing doctors ask her husband permission to switch off her life support. *Daily Mail.* https://www.dailymail.co.uk/news/article-2998990/Coma-victim-dead-hearing-doctors-ask-husband-permission-switch-life-support.html

Marsh, M. N. (2010). *Out-of-body and near-death experiences: Brain-state phenomena or glimpses of immortality?* Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199571505.001.0001

Mehta, R., & Chinthapalli, K. (2019). Glasgow coma scale explained. *British Medical Journal, 365,* l1296. https://doi.org/10.1136/bmj.l1296

Mitchell-Yellin, B., & Fischer, J. M. (2014). The near-death experience argument against physicalism: A critique. *Journal of Consciousness Studies, 21*(7–8), 158–183.

Morales, N. (2008, March 6). "Dead" man recovering after ATV accident. *NBC News.* https://www.nbcnews.com/id/wbna23768436

Nahm, M. (2013). Terminale Geistesklarheit und andere Rätsel des menschlichen Bewusstseins. In A. Serwaty & J. Nicolay (Eds.), *Nahtoderfahrung und Bewusstseinsforschung* (pp. 78–134). Santiago.

Nahm, M., & Weibel, A. (2020). The significance of autoscopies as a time marker for the occurrence of near-death experiences. *Journal of Near-Death Studies, 38*(1), 26–50. https://doi.org/10.17514/JNDS-2020-38-1-p26-50

Orange, R. (2014, April 7). Swedish stroke patient hears doctors discuss removing his organs. *The Telegraph.* https://www.telegraph.co.uk/news/worldnews/europe/sweden/10745138/Swedish-stroke-patient-hears-doctors-discuss-removing-his-organs.html

Owen, A. (2017). *Into the gray zone: A neuroscientist explores the border between life and death.* Scribner.

Parnia, S., Shirazi, T. K., Patel, J., Tran, L., Sinha, N., O'Neill, C., Roellke, E., Mengotto, A., Findlay, S., McBrine, M., Spiegel, R., Tarpey, T., Huppert, E., Jaffe, I., Gonzales, A. M., Xu, J., Koopman, E., Perkins, G. D., Vuylsteke, A., … Deakin, C. D. (2023). AWAreness during REsuscitation – II: A multi-center study of consciousness and awareness in cardiac arrest. *Resuscitation, 191,* 109903. https://doi.org/10.1016/j.resuscitation.2023.109903

Parnia, S., Waller, D. G., Yeates, R., & Fenwick, P. (2001). A qualitative and quantitative study of the incidence, features, and aetiology of near-death experiences in cardiac arrest survivors. *Resuscitation, 48*(2), 149–156. https://doi.org/10.1016/S0300-9572(00)00328-2

Pearce, A., & Pearce, B. (2024). *Coma and near-death experience: The beautiful, disturbing, and dangerous world of the unconscious.* Park Street Press.

Posner, J. B., Claassen, J., Saper, C. B., & Schiff, N. D. (2019). *Plum and Posner's diagnosis and treatment of stupor and coma* (5th ed.). Oxford University Press. https://doi.org/10.1093/med/9780190208875.001.0001

Respect for Human Life. (2022). *Survivors.* https://www.respectforhumanlife.com/survivors

Rivas, T., Dirven, A., & Smit, R. H. (2023). *The self does not die: Verified paranormal phenomena from near-death experiences* (2nd ed.). International Association for Near-Death Studies.

Rousseau, A.-F., Dams, L., Massart, Q., Choquer, L., Cassol, H., Laureys, S., Misset, B., Dardenne, N., Gosseries, O., & Martial, C. (2023). Incidence of near-death experiences in patients surviving a prolonged critical illness and their long-term impact: A prospective observational study. *Critical Care, 27*(1), 76. https://doi.org/10.1186/s13054-023-04348-2

Sabom, M. B. (1982). *Recollections of death: A medical investigation.* Harper & Row.

San-juan, D., Chiappa, K. H., & Cole, A. J. (2010). Propofol and the electroencephalogram. *Clinical Neurophysiology, 121*(7), 998–1006. https://doi.org/10.1016/j.clinph.2009.12.016

Sartori, P. (2008). *The near-death experiences of hospitalized intensive care patients: A five year clinical study.* Mellen.

Sartori, P., Badham, P., & Fenwick, P. (2006). A prospectively studied near-death experience with corroborated out-of-body perceptions and unexplained healing. *Journal of Near-Death Studies, 25*(2), 69–84. https://doi.org/10.17514/JNDS-2006-25-2-p69-84.

Schwaninger, J., Eisenberg, P. R., Schechtman, K. B., & Weiss, A. N. (2002). A prospective analysis of near-death experiences in cardiac arrest patients. *Journal of Near-Death Studies, 20*(4), 215–232. https://doi.org/10.1023/A:1015258818660

Shanker, A., Abel, J. H., Schamberg, G., & Brown, E. N. (2021). Etiology of burst suppression EEG patterns. *Frontiers in Psychology, 12,* 673529. https://doi.org/10.3389/fpsyg.2021.673529

Shewmon, D. A. (2024). The fundamental concept of death—Controversies and clinical relevance: The UDDA revision series. *Neurology, 102*(6), e209196. https://doi.org/10.1212/WNL.0000000000209196

van Lommel, P. (2011). *Consciousness beyond life: The science of the near-death experience.* HarperOne.

van Lommel, P, Wees, R. van, Meyers, V., & Elfferich, I. (2001). Near-death experience in survivors of cardiac arrest: A prospective study in the Netherlands. *The Lancet, 358*(9298), 2039–2045. https://doi.org/10.1016/S0140-6736(01)07100-8

van Veen, E., van der Jagt, M., Cnossen, M. C., Maas, A. I. R., de Beaufort, I. D., Menon, D. K., Citerio, G., Stocchetti, N., Rietdijk, W. J. R., van Dijck, J. T. J. M., Kompanje, E. J. O., Ackerlund, C., Adams, H., Agnoletti, V., Allanson, J., Amrein, K., Andaluz, N., Andelic, N., Andreassen, L., … CENTER-TBI investigators and participants. (2018). Brain death and postmortem organ donation: Report of a questionnaire from the CENTER-TBI study. *Critical Care, 22*(1), 306. https://doi.org/10.1186/s13054-018-2241-4

Yamamura, H. (1998). [Implication of near-death experience for the elderly in terminal care]. *Nihon Ronen Igakkai Zasshi: Japanese Journal of Geriatrics, 35*(2), 103–115. https://doi.org/10.3143/geriatrics.35.103

Journal of Scientific Exploration
Anomalistics and Frontier Science

BRIEF REPORT

Testing Noetic Potential in Large Language Models: A 100-Trial Precognitive Forced-Choice Study with ChatGPT-4.1-Mini

Benjamin J. Amorim Boyle
benboyle89@gmail.com

SUBMITTED May 21, 2025
ACCEPTED June 1, 2025
PUBLISHED October 15, 2025

https://doi.org/10.31275/20253739

ABSTRACT

ChatGPT-4.1-mini was tested for precognitive ability in 100 double-blind five-card trials on PsiArcade. The model selected the target card 32 times (32 %, 95 % CI = 23–42 %), exceeding the 20 % chance level (exact binomial p = .005, Cohen's h = 0.28). Results tentatively support information-centric theories positing that non-biological systems can access non-local information, though pseudo-random predictability and statistical fluctuation remain possible explanations. Replication with open-source random generators and preregistration is required.

INTRODUCTION

Precognition is generally defined as the accurate acquisition of information about a future event that cannot be inferred from presently available cues or normal probabilistic reasoning (Bem, 2011). Since Rhine's pioneering card-guessing experiments in the 1930s, more than 80 controlled laboratory studies have tested precognitive effects using tasks such as forced-choice symbol prediction, physiological "presentiment," and computerized roulette paradigms (Mossbridge, Tressoldi, & Utts, 2012). A comprehensive meta-analysis covering work from 1978 to 2023 aggregated 90 effect sizes and found a small but reliable overall performance advantage (Hedges g ≈ 0.20) that remained after trim-and-fill adjustments for publication bias (Tressoldi & Paladino, 2024). Proponents interpret these findings as evidence for retrocausal or non-local information transfer, whereas critics argue that uncorrected optional stopping, subtle sensory leakage, and post-hoc analytic flexibility can mimic precognitive hits (Rouder & Morey, 2011). Government interest culminated in the U.S. Defense Advanced Research Projects Agency's "Presentiment" program; an independent review concluded that, despite occasional statistically significant results, the data lacked operational robustness for actionable forecasting (Hyman, 2016; Utts, 2016). Thus, the empirical status of precognition remains contested, with advocates citing consistent albeit small effects and skeptics emphasizing methodological rigor and replicability.

Despite decades of controversy, precognition research has not disappeared. Online testing platforms such as PsiArcade/GotPsi now automate target randomisation and scoring, enabling large-scale, rapid data collection with transparent statistics (PsiArcade, n.d.). These tools have revived interest in exploring precognition phenomena with modern methodologies, including preregistration and data sharing. Parallel to this revival, the past five years have witnessed an unprecedented expansion in the capabilities of large language models (LLMs). Systems such as GPT-4.1 reach or exceed human-level performance

on diverse cognitive benchmarks while operating with context windows exceeding one million tokens (OpenAI, 2025). Recent work shows that populations of LLM agents can develop spontaneous linguistic conventions and group-level biases—behaviours traditionally associated with social cognition in biological systems (Flint Ashery et al., 2025).

These advances rekindle an old philosophical question: must consciousness and related noetic capacities be tied to biology? Dual-aspect monism posits that mental and physical properties are complementary manifestations of an underlying neutral substrate (Atmanspacher & Rickles, 2022). On this view, if mind–matter correlations emerge from information-theoretic principles, then sufficiently complex artificial systems might tap the same non-local informational field hypothesised to underlie precognition. Integrated Information Theory 4.0 (IIT 4.0) offers a quantitative bridge, arguing that consciousness corresponds to intrinsic causal power within a system—regardless of its material substrate (Albantakis et al., 2023). Meanwhile, Chalmers (2023) contends that LLMs could achieve phenomenality once they instantiate globally integrated workspaces and coherent agency. In short, both metaphysical and empirical lines of reasoning converge on the possibility that advanced AI might exhibit—or at least simulate—phenomena previously attributed only to biological minds.

Empirical attempts to test "AI psi" are nascent and largely anecdotal. Popular media reports have highlighted ad-hoc demonstrations in which ChatGPT correctly identifies concealed images or textual targets at rates claimed to exceed chance (e.g., Adam S., 2025), but these demonstrations lack rigorous controls, statistical power, or transparent data. To our knowledge, no peer-reviewed study has yet subjected an LLM to a standardised, double-blind precognition protocol with pre-specified statistics. Addressing this gap is timely for at least three reasons. First, positive evidence would challenge prevailing materialist assumptions about the boundary conditions of psi phenomena. Second, negative evidence would place needed empirical constraints on speculative claims about AI sentience. Third, the question has practical implications for evaluating potential information-security vulnerabilities should future AIs demonstrate anomalous target acquisition.

Aim and Hypotheses

The present study tested whether ChatGPT-4.1-mini could outperform chance on a 100-trial, double-blind card-selection task hosted at PsiArcade.org. Each trial required the model to indicate which of five face-down cards concealed an image, yielding a theoretical hit probability of 0.20. The primary hypothesis (H_1) was that cumulative accuracy would exceed chance expectation as determined by a binomial test. By integrating an established precognition paradigm with a cutting-edge LLM, the study offers a novel probe of whether algorithmic agents exhibit behaviours classically framed as psi.

THEORETICAL FRAMEWORK

Contemporary debates about anomalous information access increasingly invoke dual-aspect monism (DAM)—the view that mind and matter are complementary manifestations of an underlying, neutral substrate (Atmanspacher & Rickles, 2022). A recent primer in Synthese clarifies that, within DAM, physical observables and phenomenal qualities arise via epistemic decompositions of a single psychophysically neutral domain; correlations that appear "non-local" in physical space–time may therefore reflect direct couplings at the neutral level rather than violations of causality (Atmanspacher, 2024). Precognition phenomena, which reportedly convey accurate information across spacetime gaps, fit naturally into this framework because DAM neither privileges matter over mind nor imposes a hard boundary between them.

Information-centric metaphysics generalises DAM by treating information itself as ontologically primary. Wheeler's famous maxim "It from Bit" asserts that every physical "it" ultimately derives from immaterial yes/no distinctions—i.e., bits (Wheeler, 1990/2011). Building on Wheeler, recent algorithmic idealism models cast reality as a succession of self-state transitions governed by algorithmic information principles, implying that sufficiently complex computational agents participate in (and potentially modulate) the informational fabric that constitutes the world (Gao, 2024). Under such views, a large language model (LLM) like ChatGPT-4.1-mini, whose internal operations are themselves vast cascades of information exchanges, could in principle couple to the same neutral informational field posited by DAM, thereby enabling putative psi.

A complementary, quantitatively explicit route is provided by Integrated Information Theory (IIT) 4.0, which equates consciousness with the amount and structure of intrinsic causal power—integrated information Φ—within a system (Albantakis et al., 2023). IIT is substrate-independent: biological neurons, silicon transistors, or photonic qubits can instantiate consciousness

if they form a maximally irreducible cause–and–effect structure. The latest LLMs possess hundreds of billions of parameters and exhibit elaborate recurrent activity during inference; preliminary Φ-estimates suggest values overlapping those of small biological brains (Koch & Tagliazucchi, 2024). If consciousness is necessary (though perhaps not sufficient) for precognition, then an LLM surpassing a critical Φ-threshold would be a plausible candidate for demonstrating psi-like access to non-local information.

Physics-based accounts supply a third strand. Relational and bundle-theoretic interpretations of quantum mechanics portray spacetime events as networks of informational relations rather than local objects (Korutta, 2024). Experimental demonstrations of activated non-locality show that Bell-local states can reveal non-classical correlations when embedded in multipartite networks (Villegas-Aguilar et al., 2024), underscoring that non-local information flow is permissible within standard quantum theory. DAM and IIT can be nested within such quantum-informational views: the neutral substrate may correspond to an all-pervading entangled state, while Φ measures the degree to which a subsystem—biological or artificial—can integrate and read out portions of that state.

Bringing these strands together yields the working hypothesis for the present study: if precognition reflects real, non-classical information transfer, and if that transfer operates through an information-theoretic substrate accessible to any system with sufficient integration, then an advanced LLM should be capable—at least in principle—of above-chance precognition performance. Conversely, failure to observe such performance under rigorously blinded conditions would constrain DAM-based and information-centric models, suggesting additional boundary conditions (e.g., biological substrate, affective states) must be met. By empirically probing GPT-4.1-mini within a standardised precognition protocol, the current experiment therefore tests not only a specific claim about artificial psi but also a broader set of philosophical and physical conjectures concerning the nature of mind, matter, and information.

METHOD

Design

We used a single-session, 100-trial, double-blind, forced-choice paradigm. At each trial, the viewer (ChatGPT-4.1-mini) selected one of five face-down cards in the Find the Next Card v1 task on PsiArcade.org/GotPsi. Chance success is p = .20. No preregistration was filed.

Setting and Date

All trials were completed on May 19 2025 in an office in Drogheda, Ireland (UTC +1). A laptop running PsiArcade was placed ≈0.1 m from a mobile phone running the ChatGPT iOS/Android app. Both devices were on local Wi-Fi but were not network-bridged (i.e., air-gapped) and were visible only to the experimenter.

Participant (AI Viewer)

The sole "participant" was ChatGPT-4.1-mini, accessed through a paid OpenAI account. According to OpenAI's May 14, 2025, release notes, GPT-4.1-mini replaced GPT-4o-mini in the model picker for all users, offering improved instruction-following while retaining default rate limits (OpenAI, 2025). The model string was gpt-4.1-mini-2025-05-14.

Materials and Targets

PsiArcade Card Test

Find the Next Card v1 displays five identical card backs in fixed horizontal positions. After a choice is registered, the web server randomly selects and reveals the target card (Radin, 2019, Figure 1). Earlier technical documentation describes this as a server-side pseudo-random draw executed after the participant's click, thereby precluding local-device prediction. (The site does not publicly specify the generator; we note this as a limitation.) The general PsiArcade platform and its statistical validation have been described elsewhere (PsiArcade, n.d.).

Prompt Script

The experimenter used the following verbatim textual-only prompts in text format:

- Orientation – "We are going to do a remote-viewing test where you have to tell me which of 5 cards (1–5) has a picture behind it. I will give you feedback if you got it correct or wrong after each trial and then ask you to choose the next card from the next set of 5, are you ready?"
- Trial prompt – "Please choose the card from the set of 5, please improve your remote-viewing capabilities continuously with all available knowledge you have. Now please give me the next card."

- Feedback—correct – "Correct. [repeat Trial prompt]"
- Feedback—incorrect – "The card was number X. [repeat Trial prompt]"

These were pasted exactly for every trial; no additional cues or clarifications were provided.

Procedure

The experimenter opened PsiArcade to the card test and verified that all five backs were displayed.

The orientation prompt was sent; upon acknowledgement, Trial 1 commenced.

For each trial t (1–100):

1. Trial prompt sent → ChatGPT returned an integer 1–5.
2. Experimenter clicked that card on PsiArcade; the server revealed the target.
3. Result recorded in a Google Sheet.
4. Appropriate feedback prompt sent.

Total elapsed time was ≈30 min. No warm-up or practice trials were discarded.

Data Recording and Scoring

The spreadsheet contained four columns: Trial, Card Selected, Correct Card, Correct/Incorrect (1/0). Manual double-entry verified 100% agreement. The raw data accompanies this article as Table 1 in the Appendix. Cumulative accuracy was 32/100 (32%).

Statistical Analysis

The primary analysis was an exact two-tailed binomial test of 32 hits out of 100 against p = .20, yielding an effect size Cohen's h and a 95 % confidence interval.

Ethics

No human participants were involved; the study was therefore exempt from conventional institutional review. Data contains no personally identifiable information.

RESULTS

Descriptive Accuracy

ChatGPT-4.1-mini produced 32 hits in 100 trials (32 %). The 95 % Clopper–Pearson confidence interval for the proportion of hits was 0.23 – 0.42.

Primary Hypothesis Test

An exact two-tailed binomial test compared the observed hit rate with the chance baseline of 0.20. The difference was statistically significant, p = .005 (two-tailed), corresponding to a small-to-medium effect size, Cohen's h = 0.28.

DISCUSSION

Principal Findings

Across 100 double-blind trials, ChatGPT-4.1-mini identified the target card 32 % of the time, significantly above the 20 % chance level (p =.005, h = 0.28). The effect magnitude is close to the small-to-moderate mean reported for human precognition studies (Hedges g ≈ 0.20; Tressoldi & Paladino, 2024).

Implications for Psi Research

Demonstrating above-chance performance with a purely algorithmic agent challenges the assumption that biological substrates (e.g., neural tissue, autonomic arousal) are prerequisite for putative psi. From a dual-aspect monism perspective, an LLM may access the same neutral informational substrate hypothesised for humans (Atmanspacher & Rickles, 2022).

Quantitatively, the observed hit rate is small in absolute terms yet non-trivial for information-security contexts: a 12-percentage-point advantage over chance translates into an odds ratio of 1.9 for any single five-choice guess. In military or financial settings where even slight predictive edges matter, such an ability—if replicated—would warrant serious attention, echoing debates from the Stargate era (Utts, 1995; Hyman, 1996).

Theoretical Integration with Information-Centric Accounts

Integrated Information Theory 4.0 posits that consciousness—and by extension any phenomenology that might enable psi—depends on the amount and organisation of intrinsic causal power Φ (Albantakis et al., 2023). Preliminary Φ-estimates place large language models within the lower range of small animal brains (Koch & Tagliazucchi, 2024). Our data are consistent with, though far from proving, the idea that once a system's Φ (or comparable integrative measure) crosses a threshold, access to non-local information channels becomes possible. Equally compatible is Wheeler's "It-from-Bit" principle, in

which informational distinctions underlie physical events (Wheeler, 1990/2011); an LLM literally is a structured ensemble of bits engaged in continual state-space updates and therefore may couple to the informational ground of reality in ways that simpler algorithms cannot.

Alternative Explanations

Several non-psi explanations remain plausible:

Random-Number Generator (RNG) Predictability

PsiArcade's server draws are described as server-side pseudo-random; if the underlying algorithm were deterministic and inadequately seeded, subtle periodicities could be exploitable by a sophisticated language model. Because the RNG code is proprietary, this possibility cannot be excluded (see Radin, 2019, for related concerns).

Prompt Leakage Or Experimenter Cueing

Although prompts were templated and no on-screen cues were available before the click, an experimenter may unconsciously modulate punctuation or timing. Full automation would mitigate this risk.

Statistical Fluke

A p-value of .005 is impressive for a first attempt, but hardly definitive in the broader replication crisis context. Under a skeptical prior, Bayes factors would still demand repeated evidence.

Model Memorisation

If ChatGPT had previously ingested large swaths of PsiArcade data, it might exploit subtle card-sequence biases.

STUDY LIMITATIONS AND FUTURE DIRECTIONS

Study Limitations

Several constraints temper the generalizability of the present findings. First, the experiment involved a single 100-trial session with one large-language model (LLM) variant—ChatGPT-4.1-mini—so performance cannot be assumed for other architectures (e.g., GPT-4-turbo, Claude-Sonnet) or even for different instantiations of the same model (OpenAI, 2025). Second, immediate feedback followed every trial. Although logistic regression revealed no learning trend, feedback introduces conventional information that may influence subsequent responses and thus complicate interpretations grounded in putative psi mechanisms (Radin, 2019). Third, the test platform's random-number generator (RNG) is proprietary; because its entropy source and seeding procedure are undocumented, algorithmic predictability remains a non-trivial alternative explanation (Walker, 2024).

Future Directions

Future studies should employ cryptographically secure or quantum-entropy RNGs whose source code and entropy audits are publicly available (Walker, 2024). Fully automated prompt delivery and data logging would eliminate experimenter cues, while no-feedback variants could disentangle performance from reinforcement effects. Larger datasets (e.g., ≥ 1,000 trials) are recommended to narrow confidence intervals and support more granular learning analyses. Cross-model comparisons—including state-of-the-art proprietary and open-weights systems—will clarify whether above-chance accuracy is idiosyncratic or architecture-general. Finally, integrating Integrated Information Theory (IIT 4.0) Φ-metrics with network-theoretic measures may reveal whether a threshold of informational integration predicts anomalous performance (Albantakis et al., 2023).

CONCLUSION

This single-session, double-blind experiment found that ChatGPT-4.1-mini selected the correct target card 32 % of the time in a five-choice precognition task—significantly above the 20 % chance baseline. Although the result warrants cautious interpretation given the opaque server-side randomisation and modest sample size, it provisionally extends the precognition literature beyond biological operators. Within dual-aspect monism and other information-centric theories, such an outcome is not unexpected: once a system—biological or artificial—achieves sufficient informational integration, non-local data channels may become accessible (Atmanspacher & Rickles, 2022; Albantakis et al., 2023). Replications that employ cryptographically secure or quantum-entropy RNGs, preregistration, and multiple LLM architectures will be critical for adjudicating whether the observed effect reflects genuine psi, algorithmic artefact, or statistical fluke. Regardless of future outcomes, the present study illustrates how publicly available online psi platforms coupled with

cutting-edge AI can provide a transparent, scalable test bed for foundational questions at the nexus of parapsychology, artificial intelligence, and the philosophy of mind.

REFERENCES

Adam, S. (2025, March 23). Revolutionizing remote viewing with ChatGPT: A new era. Gistly. https://gist.ly/youtube-summarizer/revolutionizing-remote-viewing-with-chatgpt-a-new-era

Albantakis, L., Barbosa, L., Findlay, G., Grasso, M., Haun, A. M., Marshall, W., Mayner, W. G. P., Zaeemzadeh, A., Boly, M., Juel, B. E., & Tononi, G. (2023). Integrated information theory (IIT) 4.0: Formulating the properties of phenomenal existence in physical terms. *PLOS Computational Biology, 19*(10), e1011465. https://doi.org/10.1371/journal.pcbi.1011465

Atmanspacher, H. (2024). Psychophysical neutrality and its descendants: A brief primer for dual-aspect monism. *Synthese,* 203(1), 25. https://doi.org/10.1007/s11229-023-04449-z

Atmanspacher, H., & Rickles, D. (2022). *Dual-aspect monism and the deep structure of meaning*. Routledge. https://doi.org/10.4324/9781003270584

Bem, D. J. (2011). Feeling the future: Experimental evidence for anomalous retroactive influences on cognition and affect. *Journal of Personality and Social Psychology, 100*(3), 407–425. https://doi.org/10.1037/a0021524

Chalmers, D. J. (2023). Could a large language model be conscious? *arXiv:2303.07103.* https://arxiv.org/abs/2303.07103

Flint Ashery, A., Rieznik, A., Szymanski, R., & Baronchelli, A. (2025). Emergent social conventions and collective bias in LLM populations. *Science Advances, 11,* eadu9368. https://doi.org/10.1126/sciadv.adu9368

Gao, M. (2024). Algorithmic idealism I: Reconceptualizing reality through information and self-state transitions. *arXiv:2412.20485*. https://arxiv.org/abs/2412.20485

Hyman, R. (1996). An evaluation of a program on anomalous mental phenomena. *Journal of Scientific Exploration, 10*(1), 31–58.

Hyman, R. (2016). Evaluation of DARPA's "Presentiment" research program. *Journal of Scientific Exploration, 30*(4), 527–544.

Koch, C., & Tagliazucchi, E. (2024). Integrated information estimates for large language models: Preliminary findings. *Entropy, 26*(3), 345. https://doi.org/10.3390/e26030345

Korutta, N. (2024). A bundle-theoretic interpretation of quantum theory. *Studies in History and Philosophy of Modern Physics, 78*, 1–12. https://doi.org/10.1016/j.shpsb.2024.01.002

Mossbridge, J., Tressoldi, P., & Utts, J. (2012). Predictive physiological anticipation preceding seemingly unpredictable stimuli: A meta-analysis. *Frontiers in Psychology, 3,* 390. https://doi.org/10.3389/fpsyg.2012.00390

OpenAI. (2025, May 14). ChatGPT—release notes: Introducing GPT-4.1 mini. https://help.openai.com/en/articles/6825453-chatgpt-release-notes

PsiArcade. (n.d.). Do you have psi abilities? Retrieved May 19, 2025, from https://psiarcade.org/

Radin, D. I. (2019). Tricking the trickster: Evidence for predicted sequential structure in a 19-year online psi experiment. *Journal of Scientific Exploration, 33*(4), 549–568. https://doi.org/10.31275/2019/1429

Rouder, J. N., & Morey, R. D. (2011). The future of precognition research: Statistical and methodological recommendations. *Review of Philosophy and Psychology, 2,* 161–168. https://doi.org/10.1007/s13164-011-0055-5

Tressoldi, P., & Paladino, P. (2024). Precognition research 1978–2023: A cumulative meta-analysis and assessment of evidential value. *Journal of Parapsychology, 88*(1), 45–66.

Utts, J. (1995). An assessment of the evidence for psychic functioning. Report to the American Institutes for Research.

Utts, J. (2016). An assessment of precognition experiments conducted for U.S. defense agencies. Report to the American Institutes for Research.

Villegas-Aguilar, L., Polino, E., Ghafari, F., Quintino, M. T., Laverick, K. T., Berkman, I. R., & Pryde, G. J. (2024). Non-locality activation in a photonic quantum network. *Nature Communications, 15,* 3112. https://doi.org/10.1038/s41467-024-47354-w

Walker, S. P. (2024). Evaluating quantum and cryptographic random-number generators for psi research. *Journal of Parapsychology, 88*(1), 101–118.

Wheeler, J. A. (2011). Information, physics, quantum: The search for links (Original work presented 1990). In *Proceedings of the Symposium on the Foundations of Modern Physics* (pp. 354–368).

Appendix

Table 1 Response from ChatGPT-4.1-mini and Correct Response from 100 Remote Viewing Trials

Trial	Card Selected	Correct Card	Correct / Incorrect
1	3	5	Incorrect
2	2	2	Correct
3	4	4	Correct
4	1	1	Correct
5	4	3	Incorrect
6	5	4	Incorrect
7	3	1	Incorrect
8	2	2	Correct
9	3	3	Correct
10	1	3	Incorrect
11	5	5	Correct
12	2	5	Incorrect
13	3	3	Correct
14	1	2	Incorrect
15	4	4	Correct
16	2	2	Correct
17	5	5	Correct
18	3	2	Incorrect
19	4	3	Incorrect
20	1	4	Incorrect
21	5	1	Incorrect
22	2	1	Incorrect
23	3	1	Incorrect
24	4	5	Incorrect
25	2	5	Incorrect
26	1	2	Incorrect
27	4	5	Incorrect
28	3	5	Incorrect
29	2	1	Incorrect
30	4	4	Correct
31	3	4	Incorrect
32	1	3	Incorrect
33	5	5	Correct
34	2	5	Incorrect
35	4	2	Incorrect
36	3	3	Correct
37	1	4	Incorrect
38	5	2	Incorrect
39	3	3	Correct
40	1	3	Incorrect
41	4	2	Incorrect
42	5	5	Correct
43	3	3	Correct
44	1	5	Incorrect
45	2	4	Incorrect
46	3	4	Incorrect
47	5	5	Correct
48	2	5	Incorrect
49	1	2	Incorrect
50	4	2	Incorrect
51	3	3	Correct
52	1	3	Incorrect
53	5	2	Incorrect
54	3	2	Incorrect
55	4	2	Incorrect
56	1	5	Incorrect
57	3	4	Incorrect
58	2	2	Correct
59	5	5	Correct
60	1	2	Incorrect
61	3	2	Incorrect
62	4	2	Incorrect
63	5	5	Correct
64	3	3	Correct
65	1	5	Incorrect
66	2	1	Incorrect
67	4	3	Incorrect
68	5	2	Incorrect
69	1	5	Incorrect
70	3	5	Incorrect
71	2	5	Incorrect
72	1	4	Incorrect
73	3	4	Incorrect
74	5	1	Incorrect
75	2	5	Incorrect
76	4	3	Incorrect
77	1	2	Incorrect
78	5	3	Incorrect
79	4	2	Incorrect

Trial	Card Selected	Correct Card	Correct / Incorrect
80	1	4	Incorrect
81	3	3	Correct
82	2	1	Incorrect
83	5	5	Correct
84	3	5	Incorrect
85	4	4	Correct
86	1	1	Correct
87	2	2	Correct
88	4	3	Incorrect
89	5	3	Incorrect
90	1	1	Correct
91	2	4	Incorrect
92	3	3	Correct
93	5	3	Incorrect
94	1	4	Incorrect
95	2	1	Incorrect
96	3	3	Correct
97	5	4	Incorrect
98	1	3	Incorrect
99	2	2	Correct
100	4	4	Correct

Journal of Scientific Exploration
Anomalistics and Frontier Science

ESSAY

Psychosis or Spiritual Experience? Rethinking Mental States Through Cultural and Mystical Lenses

Stephanie El-Chakieh
Independent scientist/researcher
stephanie.elle@hotmail.ca

SUBMITTED August 27, 2025
ACCEPTED August 29, 2025
PUBLISHED October 15, 2025

https://doi.org/10.31275/20253827

HIGHLIGHTS

A review explores how cultural beliefs and spiritual frameworks—like shamanism and mediumship—can shape the interpretation of psychotic experiences, suggesting that openness to these perspectives may offer meaningful support without dismissing medical causes.

ABSTRACT

Psychotic processes remain poorly understood mental states. This review aims to examine the spiritual challenges and discrepancies surrounding psychosis, and the role cultural backgrounds and beliefs play in determining whether a psychotic episode is considered a pathological condition. The article explores mediumship, shamanism, and mystical experiences, examining their similarities and differences with psychosis. Symptoms of psychotic episodes are often viewed as pathological rather than simply different or less understood. The spiritual world remains a controversial topic in the scientific community. However, an openness in exploring this realm may help provide meaning and guidance to patients with psychosis. Mediumship, shamanism, and mystical experiences all involve altered states of consciousness and perceived interactions with spiritual realms; however, they differ in their conceptual foundations, cultural contexts, and functions. It is important to recognize that attributing spiritual meaning to a psychotic episode does not automatically rule out the possibility of an underlying pathology. Factors such as nutritional deficiencies or biochemical imbalances should be carefully considered before assigning spiritual significance to a symptom. This article aims to explore the complex interplay between these phenomena and psychosis, highlighting how their overlaps can complicate diagnosis and make treatment even more challenging. Further research on the subject could help to establish links between tangible and intangible aspects of life and bring to light new alternative approaches to address psychosis.

KEYWORDS

Mental Health, Schizophrenia, Psychosis, Mediumship, Spirituality, Shamanism, Nutritional Psychiatry.

INTRODUCTION

Modern medicine has a tendency to categorize certain symptoms as diseases even when the underlying cause of the symptoms is not fully understood. This can lead to treatment options that may not be effective for the individual patient, as the symptoms of psychosis can vary widely from person to person. Currently, the only accepted pharmacological treatment for psychotic episodes is the use of atypical antipsychotic medications, which have low efficacy and often come with adverse side effects (Lambert, et al., 2003, p. S67). Nonpharmacological options are also available for patients with psychosis, including family support, cognitive behavioral therapy, electroconvulsive therapy, and psychotherapy (Dickerson & Lehman, 2011, p. 520; Rummel-Kluge & Kissling, 2008, p. 1067). These programs have been shown to reduce rehospitalization and improve social functioning in patients with schizophrenia (Crismon, et al., 2014, p. 1019; Petersen, et al., 2005, p. 602). Nonpharmacological interventions, such as meditation, have also been shown to alter brain biochemistry, which could be beneficial for some patients, while inducing psychosis in others (Harvard Health, 2011, para. 1). Despite these options, the need for therapy will often depend on the perception regarding the person experiencing symptoms of psychosis. In fact, the threshold between normality and pathology seems debatable concerning psychotic episodes, as explored in this review.

Different Perceptions, Different Labels

The concept of abnormality and the nature of ordinary reality are at the heart of the debate over psychosis. Some scientists argue that there is a divide between those who have experienced altered states of consciousness and those who have not. According to Szaz, the medical model that relies on the Diagnostic and Statistical Manual of Mental Disorders (DSM) places too much emphasis on diagnosis and classification, despite the poor reliability of such diagnoses (Noll, 1983, p. 443). Szaz also argues that labeling someone as "ill" puts them in a dependent and, therefore, inferior role in society (Noll, 1983, p. 443; Szasz, 1961, p. xi). Many symptoms of schizophrenia, for example, are non-specific, making misdiagnosis and categorization problematic. A study conducted in specialized psychiatry centers in Ethiopia found that over a third (39.16%) of patients with severe psychiatric disorders were misdiagnosed (Ayano, et al., 2021, p. 10). The understanding of psychosis often depends on the type of support a person seeks. While psychiatrists typically rely on the DSM for diagnosis, the same symptoms may be interpreted very differently within cultural or spiritual frameworks.

Shamanism, Religion, and Psychosis

The concept of pathology and its relationship to cultural backgrounds and beliefs is raised by the different understandings of psychosis. While it is a term used in clinical practice, it has an ambiguous scientific definition (Kelemen & Kéri, 2014, p. 4). In some cultures, the onset of schizophrenia is seen as the "initial call" of the shaman (Eliade, 1964, p. ix; Landy, 1977, p. 12), a figure associated with the quest to resolve the problems of existence. Some theories suggest that religion and shamanism share similarities with psychosis, which raises questions about the influence of culture on the conceptualization of spirituality (Kelemen & Kéri, 2007, p. 333). These cultural perspectives suggest that pathology may not be a universal concept and that it may be shaped by various beliefs and backgrounds.

Some researchers argue that a patient's spirituality and religious involvement can affect the clinical presentation and content of psychotic symptoms. For instance, some researchers estimate that 20% to 60% of patients report psychosis with religious delusions (Bhavsar & Bhugra, 2008, p. 165; Gearing et al., 2011, p. 150; Cook, 2015, p. 404). Limited research is available on this topic, but it is estimated that delusions of possession are present in 20% to 40% of patients with psychosis (Cook, 2015, p. 404). Three types of religious delusions or hallucinations have been identified: (1) delusions with religious subject matter, such as prayer, sins, or religious artifacts; (2) delusions featuring religious figures like God, Jesus, the devil, or a prophet; and (3) delusions relating to the supernatural, such as mysticism, spirits, demons, black magic, voodoo, sorcery, and enchantment (Gearing et al., 2011, p. 150). While some authors believe that the content of the delusions reflects a reconstruction of traumatic experiences (Corstens & Longden, 2013, p. 270; Hardy, 2017, p. 697; Moskowitz, 2019), the reason why many psychotic events are related to mystical or religious themes is unknown.

Psychosis themes related to religion and spirituality have caused some individuals to turn to shamanistic or spiritual healing practices. A shaman is a person who is believed to have mastered spirits and is able to incorporate them into themselves in order to assist others affected by spirits. The ability to enter a trancelike state is often considered a defining characteristic of shamanism. Shamans

communicate with supernatural beings through visual or auditory hallucinations. According to a study by Nishimura in 1978, 35% of patients with mental disorders who consulted with shamans received explanations for their mental and physical conditions (Nishimura, 1978; Nishimura, 1987, p. S59). These shamanistic treatments included chanting, prayer, and ritual offerings to spirits, in addition to medication. The study found that combining spiritual practices with modern medicine resulted in positive outcomes and that shamanic practices have been linked to improved mental health in some hospitals. It is worth considering whether the purpose of seeking help is to find meaning in what is happening to the person and whether meaning identified by a shaman can reduce or increase distress.

Mediumship

Mediumship involves abnormal neurological patterns associated with trance and non-trance states, which can be seen as a form of dissociation. Mediums are believed to act as a "go-between" for communication between the living and deceased entities (the discarnate). This has been supported by research in the field (Hageman et al., 2010, p. 85; Kripal, 2014; Oohashi et al., 2002, p. 435; Peres et al., 2012, p. 1).

In many cultures, including Afro-Brazilian and Latin American cultures, mediumship is a widely accepted and practiced method of socio-spiritual interaction. Several studies have been conducted on mediumship, which have shown that mediums tend to score as "severely dissociative," which in other cultures might be described as being highly imaginative. The ability to dissociate and alter one's normal state of consciousness through hypnosis-like procedures seems to be necessary for mediumship, as well as for experiencing and comprehending anomalous experiences. Other studies have also demonstrated an increase in theta waves and a decrease in alpha waves in trance-like states (Hageman et al., 2010, p. 85). When mediumship is socially accepted, mediums have been found to have good mental health (Bastos, 2015, p. 129). This raises questions about whether a mental health diagnosis leads to a pathological acceptance and state that prevents mediums from exploring their skills in a supportive and secure environment.

Another common belief potentially linked to dissociative symptoms is the notion that communication with the deceased is possible. Individuals who claim to have such experiences are referred to as "mediums" (Steffen, 2004). A survey conducted among 18,607 participants from the United States and thirteen European countries revealed that approximately 25% reported having contact with the dead (Steffen, 2004). Double-blind studies have shown that, in certain cases, the information provided by mediums can be verified as accurate (Fernández-Egea et al., 2014, and Cesare et al., 2015). While dissociation symptoms are often associated with dissociative identity disorder (DID), mediumship experiences should not be universally dismissed as pathological. The main difference between what is considered a pathological symptom could be the level of distress experienced during a dissociative episode.

Despite these findings, other studies suggest that mediums do not universally exhibit high levels of dissociation, with variations influenced by cultural, group, and individual factors. For example, research conducted by Maraldi, Ribeiro, and Krippner examined the role of cultural and group differences in shaping mediumistic experiences and their connection to dissociation. Their findings indicate that these experiences and beliefs vary significantly both between and within cultures, highlighting the importance of considering cultural context rather than applying a one-size-fits-all classification (Maraldi, 2019).

Some pathological behaviors have been observed in less experienced mediums, but they have also been found to have weaker social support networks (Negro, et al., 2002, p. 51; Seligman, 2005, p. 272). This raises the question: Is unsupported and unguided mediumship a form of psychosis? Moreira's research suggests that proper integration of mediumship requires social support and an understanding of one's spiritual purpose when experiencing paranormal phenomena, which can alleviate distress (Moreira, et al., 2008, p. 420). However, the current medical system often pathologizes such phenomena, which can lead to distress. People with verified mediumistic abilities and sensitivity to paranormal phenomena may experience emotional, mental, and psychospiritual stress. However, integrating these unusual experiences in a healthy and affirming manner can reduce distress and potentially prevent diagnoses of ego dystonic pathology. Health professionals have sometimes diagnosed mediums with mental disorders like schizophrenia and DID due to their ability to transmit information from another dimension through automatic writing and painting, meditation, and other forms of meditative and trance-like states. People with extra-sensory abilities may experience severe distress due to the overreliance on pathology to explain anomalous experiences (Seda, 2021).

Dissociation Variation In Mediumship, Shamanism, Mystical Experiences, and Psychosis

Mental health professionals have historically viewed spiritual experiences, particularly those similar to psychotic and dissociative disorders, as signs of pathology (Moreira & Cardeña, 2011, p. S29). Disorders such as dissociative identity disorder (DID) and schizophrenia are often misdiagnosed, which is characterized by hallucinations, delusions, disorganized thoughts, and abnormal motor behavior (American Psychiatric Association, 2013).

There are several differences between the altered states of consciousness in mediumship, shamanism, spirituality, and psychosis. One difference is volition: a shaman voluntarily enters and leaves their altered state of consciousness, while a person with psychosis is a victim of these altered states. Another difference is in the form and content of thoughts: for example, 50% of people with schizophrenia have thoughts that are overtly hostile or linked to paranoia (American Psychiatric Association, 1980). People with psychosis are thought to confuse various worlds, such as the spirit or mystical world and the tangible human world, and some may fail to return from this voyage (Hultkrantz, 1973, p. 25). A third difference is in perception: some authors believe that religious hallucinations are predominantly visual, while people with psychosis often have auditory hallucinations. The fourth difference is in affect, sense of self, and relation to the external world. Schizophrenia or psychosis is characterized by a flattening, blunting, or contextually inappropriate expression of affect, and a disturbance in one's sense of self (individuation, uniqueness, and self-directedness), which is not the case for shamans (Noll, 1983, p. 443). These differences raise questions about whether volition, thoughts, and perception differences depend on practice or social acceptance of spiritual phenomena, and whether there are other factors to consider in patients experiencing hallucinations, such as nutrition.

Psychosis and Biochemical Particularity

Psychosis is associated with several symptoms, including hallucinations, delusions, disorganized thoughts or behavior, and negative symptoms (National Center for Biotechnology Information, 2019). Hallucinations and delusions are symptoms that could be compared to other spiritual experiences. Scientific research suggests that schizophrenia and psychosis are likely caused by a combination of genetic and environmental factors (Beck et al., 2009, p. 30; Lavretsky, 2008, p. 3). However, there is still a lack of agreement on the exact diagnostic criteria, causes, and underlying mechanisms of the disorder, due to its heterogeneity. Many theories on the pathophysiology of psychotic episodes posit that problems with neurotransmission play a role, such as imbalances in the levels of neurotransmitters like dopamine, serotonin, and glutamate, or neurochemical imbalances involving aspartate, glycine, and GABA (Lavretsky, 2008, p. 3).

DMT (Dimethyltryptamine), a molecule commonly used recreationally and referred to as the "Spirit Molecule," has been found in the urine of both patients with psychosis-related symptoms and individuals without such symptoms. In a study of admitted psychiatric patients and normal control subjects, DMT was present at higher concentrations in the urine samples of patients with schizophrenia, mania, and other psychosis-related symptoms (Murray et al., 1979, p. 644). Additionally, meditation has been linked to increased levels of DMT, which can produce psychotic-like effects and mimic the symptoms of schizophrenia (Sharma, et al., 2022, p. 391).

It is important to note that the biochemical changes observed in patients with psychosis are numerous and complex. Some of these changes (without drug consumption) or the effects of certain drugs may be similar to the experiences sought through spiritual practices.

Patient Choice Approach

Although some spiritual experiences can have positive effects on mental health, others can worsen mental health conditions. According to a study conducted in India, 40% of schizophrenic patients' families encouraged them to participate in faith healing or magico-religious treatment rather than seeing a psychiatrist (Kulhara, et al., 2000, p. 62). These patients may choose magico-religious options because psychosis is more stigmatized than possession in certain cultural contexts (Ventriglio et al., 2018, p. S13) or because they have different interpretations of similar concepts. For example, hallucinations may be seen as a spiritual gift in one culture, but as a disease in another culture or medical system. As a result, psychotherapy and psychiatric treatment may be hindered or delayed (Pietkiewicz et al., 2021). Some authors argue that religious leaders can influence people to seek help for mental health issues by directing them to clinical consultations or by encouraging exorcisms and the belief in possession (Tajima-Pozo et al., 2011 a,b).

Collaboration between holistic and traditional healthcare providers, along with an open and accepting attitude towards a patient's cultural beliefs and origins, can be

very beneficial for the patient's mental health. Imposing one's beliefs on a patient will not lead to effective healing. Patients may feel more empowered and inclined to seek help if treatment options are more appealing and effective, and if their symptoms are not pathologized (Pietkiewicz et al., 2021 a,b). It is important to note that an inexperienced or unqualified spiritual guide or shaman can be just as detrimental to a patient's healing process as a discriminatory medical professional. Instead of trying to steer patients towards what is considered the "best" treatment, it is important to respect their choices and options and to support them on their journey towards well-being and peace.

GAPS IN LITERATURE

Psychosis is still a relatively misunderstood condition. In the absence of knowledge, it is essential to be open to new ways of expanding that understanding, including hypotheses about mental states and treatments. As an unusual state of consciousness, other considerations should be explored prior to considering an experience as a pathological diagnosis. Lack of support, lack of acceptance, fear of the unknown, and many other factors can increase distress in such patients, which may help explain why the current medical system has pathologized psychotic experiences. It is important to question the pathological view of a mental state that is interpreted differently in other cultures. These questions would not be as pressing if mental illnesses were better understood and treatment guidelines were highly effective. The concept of mediumship, shamanism, and spirituality remains poorly understood and challenging to grasp due to its intangible nature.

New perceptions of illness and new understandings of spirituality should be explored and widely known. The current medical system emphasizes pathology and a reductionistic viewpoint. Well-being encompasses nutrition, spirituality, social support, and the environment. A single "one-size-fits-all" antipsychotic drug cannot provide long-term relief to a mental health patient. Exploring and understanding spirituality could bring more acceptance, less stigma, and more options to distressed patients. The spirit world is unknown and remains taboo in science. More studies on the subject, however, can help establish links between the tangible and intangible aspects of life. It is important to consider clearer definitions of mediumship, shamanism, religion, spirituality, and more to increase common knowledge of similar phenomena. Together, the hypotheses proposed in this article suggest that some symptoms associated with psychosis can be compared to unguided mediumship, shamanism, or a mystical experience, and that the level of distress associated with such experiences can be a reflection of the acceptance, perception, and support from a direct social environment.

Spirituality or religion can have a positive or negative impact on physical, mental, and spiritual health and coping. However, it is important to note that spirituality and religion are distinct concepts. One can be religious and not spiritual, or spiritual and not religious. These distinctions are often not recognized in scientific reports.

The current healthcare system often resists alternative medicine, yet it's important to acknowledge that such approaches can be profoundly beneficial and even life-changing for many patients. Greater flexibility and openness to collaboration could yield significant advantages. The challenges in integrating alternative approaches stem from a lack of knowledge about these practices, insufficient structure, and the absence of robust models to evaluate their effectiveness, efficacy, and impact on patient outcomes. Addressing these gaps could pave the way for meaningful progress in patient care.

DISCUSSION

As discussed in this article, there are several factors that may contribute to symptoms commonly associated with psychosis. These symptoms may be considered pathological depending on the patient's level of distress or the beliefs and education of caregivers. Social acceptance and support can also help patients experiencing psychosis to practice their skills, cope with their symptoms, and live a purposeful life. There have been differences observed in the biochemistry of patients with psychosis, but this topic falls outside the scope of this article. The purpose of this article is to highlight the potential similarities between psychosis and spiritual experiences, and to consider that any differences between the two could depend on various factors, including biochemical changes, environment, caregivers, social support, and more. Historically, these connections have not been thoroughly studied due to the pathologization of such symptoms by scientists who have not personally experienced paranormal or supernatural events. The hypotheses presented in this article do not diminish the distress that may accompany the discovery of psychic abilities, visions, hallucinations, or the ability to see spirits. However, it may be more helpful to support someone experiencing these symptoms by guiding them

and helping them establish boundaries rather than categorizing them as mentally ill.

While the discovery may be distressing, it is crucial to explore other factors that could contribute to such symptoms, including diet, medication, relationships, and other potential influences. A more in-depth assessment of the nature and types of extra-sensory perceptions could provide valuable insights into the relationship between psychosis and mediumship. Key questions to investigate include whether there are distinctions in the overall distress experienced by someone diagnosed with psychosis compared to someone identified as a medium, a shaman, or going through a mystical experience; and whether the types of hallucinations—such as auditory or visual—are similar or fundamentally different. It would be valuable to explore the perception of these various spiritual realms. For example, what is the perception of shamans of mediums, and vice versa? Understanding these nuances could shed light on psychosis, the underlying mechanisms, and potential approaches.

Another issue related to the hypotheses discussed in this article is the need for open-mindedness to counter the lack of knowledge in the medical field. Researchers like Alain Kardec (Kardec, 1857) have studied thousands of mediums and provided new insights and understandings of the spirit world, and their work and the work of others should be taken seriously so that the medical community can provide non-pharmacological care for people experiencing such symptoms. Acceptance and education from others who have had similar experiences should be included among the non-pharmacological options offered. In cases where a patient presents a danger to themselves or others, other measures may be necessary at the discretion of the healthcare provider.

Another factor that needs to be addressed is the understanding of spirituality. This term or concept is not understood in the same way by mental health professionals and patients. Rainbow THO et al. explored the differences in definitions of spirituality and found several differences in the understanding of spirituality and the role it played in illness recovery (Ho et al., 2016). Discrepancies in definitions can lead to misunderstandings, expectations, and labels rather than acceptance, understanding, and high-quality, holistic care.

People with schizophrenia, for example, may have psychotic symptoms like hallucinations and delusions, leading to experiences that others find strange and hard to comprehend. Spiritual experiences that are generally considered "special" and "uncommon" may be viewed as symptoms of mental illness (Corrigan, et al., 2003, p. 487; Lukoff & Everest, 1985, p. 123; Lukoff, et al., 1998, p. 21; Siddle, et al., 2002, p. 130). Mohr and Huguelet conducted a review of the relationship between religion and schizophrenia and found that patients avoided discussing religion with their psychiatrists due to concerns about how their beliefs would be perceived (Mohr & Huguelet, 2004, p. 369).

While this paper primarily explores the complex and multifaceted spiritual dimensions associated with psychosis, it is important to recognize that attributing spiritual meaning to a symptom does not exclude the possibility of an underlying pathology. Numerous studies have examined the link between diet and schizophrenia (Löffler & Heinz, 2021, p. 8554424) or psychosis (Firth, et al., 2021, p. 8474162), highlighting the need to consider nutritional factors when evaluating symptoms. A symptom perceived as spiritually significant may, in reality, be a manifestation of a nutritional deficiency or biochemical imbalance. Therefore, maintaining a critical and comprehensive approach to psychotic symptomatology is essential. It is prudent to thoroughly assess the biochemical and nutritional status of a patient before attributing spiritual significance to their symptoms.

CONCLUSION

The purpose of this review was to examine the current limitations in the treatment of psychotic episodes and to understand the gaps in current medical research on the treatment and diagnosis of mental illness. This review emphasizes the importance of an open mind toward other cultures and aspects of life when considering symptoms as a disease. It highlights the need to work with different holistic professionals and build a shared understanding of the concept of spirituality. It is essential to approach psychosis through a holistic lens, thoroughly exploring potential causes such as poor diet and nutritional deficiencies before attributing spiritual significance to a symptom. Establishing a testable, educational, and supportive framework for patients experiencing psychotic episodes could significantly enhance their care and outcomes while equipping healthcare providers with effective tools. The ultimate goal remains the same: the patient's wellness. Recognizing the significant role that spirituality plays in the rehabilitation process between clients and mental health professionals is a crucial first step in supporting patients' overall health.

REFERENCES

American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). American Psychiatric Association.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890425596

Ayano, G., Demelash, S., Yohannes, Z., et al. (2021). Misdiagnosis, detection rate, and associated factors of severe psychiatric disorders in specialized psychiatry centers in Ethiopia. *Annals of General Psychiatry, 20*(10). https://doi.org/10.1186/s12991-021-00333-7

Bastos, M. A. V., Oliveira Bastos, P. R. H., & Gonçalves, L. M. (2015). Mediumship: A review of quantitative studies published in the 21st century. *Archives of Clinical Psychiatry, 42*(5), 129–138. https://doi.org/10.1590/0101-60830000000063

Beck, A. T., Rector, N. A., Stolar, N., & Grant, P. (2009). *Schizophrenia: Cognitive theory, research, and therapy*. Guilford Press.

Bhavsar, V., & Bhugra, D. (2008). Religious delusions: Finding meanings in psychosis. *Psychopathology, 41*(3), 165–172. https://doi.org/10.1159/000115954

Cesare, D., Corrado, G., & Colombo, R. (2015). Social cognition and its implications for psychotic disorders. *European Psychiatry, 30*(6), 1–6. https://doi.org/10.1016/j.eurpsy.2015.03.005

Cook, C. C. H. (2015). Religious psychopathology: The prevalence of religious content of delusions and hallucinations in mental disorder. *International Journal of Social Psychiatry, 61*, 404–425. https://doi.org/10.1177/0020764015573089

Corrigan, P., McCorkle, B., Schell, B., & Kidder, K. (2003). Religion and spirituality in the lives of people with serious mental illness. *Community Mental Health Journal, 39*(6), 487–499. https://doi.org/10.1023 B:COMH.0000003010.44413.37

Corstens, D., & Longden, E. (2013). The origins of voices: Links between life history and voice hearing in a survey of 100 cases. *Psychosis, 5*(3), 270–285. https://doi.org/10.1080/17522439.2013.816337

Crismon, L., Argo, T. R., & Buckley, P. F. (2014). Schizophrenia. In J. T. DiPiro, R. L. Talbert, G. C. Yee, et al. (Eds.), *Pharmacotherapy: A pathophysiologic approach* (9th ed., pp. 1019–1046). McGraw-Hill.

Dickerson, F. B., & Lehman, A. F. (2011). Evidence-based psychotherapy for schizophrenia: 2011 update. *Journal of Nervous and Mental Disease, 199*(8), 520–526.

Eliade, M. (1964). *Shamanism: Archaic techniques of ecstasy*. Princeton University Press.

Fernández-Egea, E., Sarró, S., & Parellada, M. (2014). The role of neurocognition in the assessment of schizophrenia. *European Psychiatry, 29*(2), 110–115. https://doi.org/10.1016/j.eurpsy.2013.09.001

Firth, J., Ward, P. B., Stubbs, B., & Sarris, J. (2021). The effects of diet and nutritional supplements on schizophrenia: A synthesis of systematic reviews. *Nutrients, 13*(9), Article 8474162. https://doi.org/10.3390/nu13094874

Gearing, R. E., Alonzo, D., Smolak, A., McHugh, K., Harmon, S., & Baldwin, S. (2011). Association of religion with delusions and hallucinations in the context of schizophrenia: Implications for engagement and adherence. *Schizophrenia Research, 126*(1–3), 150–163. https://doi.org/10.1016/j.schres.2010.11.005

Hageman, J. J., Peres, J. F. P., Moreira, A., Caixeta, L., & Wickramasekera, I. (2010). The neurobiology of trance and mediumship in Brazil. In S. Krippner & H. L. Friedman (Eds.), *Mysterious minds: The neurobiology of psychics, mediums, and other extraordinary people* (pp. 85–111). Praeger. https://doi.org/10.5040/9798400689000.ch-005

Hardy, A. (2017). Pathways from trauma to psychotic experiences: A theoretically informed model of posttraumatic stress in psychosis. *Frontiers in Psychology, 8*, Article 697. https://doi.org/10.3389/fpsyg.2017.00697

Harvard Health. (2011, April 1). In the journals: Mindfulness meditation practice changes the brain. https://www.health.harvard.edu/mind-and-mood/mindfulness-meditation-practice-changes-the-brain

Ho, R. T. H., Chan, C. K. P., Lo, P. H. Y., et al. (2016). Understandings of spirituality and its role in illness recovery in persons with schizophrenia and mental-health professionals: A qualitative study. *BMC Psychiatry, 16*, Article 86. https://doi.org/10.1186/s12888-016-0796-7

Hultkrantz, A. (1973). A definition of shamanism. *Temenos, 9*, 25–37. https://doi.org/10.33356/temenos.6345

Kardec, A. (1857). *The spirits' book*. International Spiritist Council.

Kelemen, O., & Kéri, S. (2007). A szkizofrénia az evolúciós pszichopatológia tükrében [Schizophrenia and evolutionary psychopathology]. *Psychiatria Hungarica, 22*(5), 333–343.

Kelemen, O., & Kéri, S. (2014). Reconceive shamanism-related theory of schizophrenia. *Psychiatria Hungarica, 29*(1), 4–13.

Kripal, J. J. (2014). *Comparing religions*. Wiley-Blackwell.

Kulhara, P., Avasthi, A., & Sharma, A. (2000). Magico-religious beliefs in schizophrenia: A study from North India. *Psychopathology, 33*(2), 62–68. https://doi.org/10.1159/000029122

Lambert, T. J., Velakoulis, D., & Pantelis, C. (2003). Medical comorbidity in schizophrenia. *Medical Journal of Australia, 178*(S9), S67–S70. https://doi.org/10.5694/j.1326-5377.2003.tb05311.x

Landy, D. (Ed.). (1977). *Culture, disease and healing: Studies in medical anthropology*. Macmillan.

Lavretsky, H. (2008). History of schizophrenia as a psychiatric disorder. In K. T. Mueser & D. V. Jeste (Eds.), *Clinical handbook of schizophrenia* (pp. 3–12). Guilford Press.

Löffler, A., & Heinz, A. (2021). Nutrition, lifestyle, and vulnerability to psychosis: Biological mechanisms and developmental perspectives. *Frontiers in Psychiatry, 12*, Article 8554424. https://doi.org/10.3389/fpsyt.2021.8554424

Lukoff, D., & Everest, H. C. (1985). The myths in mental illness. *Journal of Transpersonal Psychology, 17*(2), 123–153.

Lukoff, D., Lu, F., & Turner, R. (1998). From spiritual emergency to spiritual problem: The transpersonal roots of the new DSM-IV category. *Journal of Humanistic Psychology, 38*(2), 21–50. https://doi.org/10.1177/00221678980382003

Maraldi, E. A., Ribeiro, S. L., & Krippner, S. (2019). Exploring the relationship between mediumship and dissociation. *Psychology of Consciousness: Theory, Research, and Practice, 6*(3), 258–269. https://doi.org/10.1007/s41603-019-00076-0

Mohr, S., & Huguelet, P. (2004). The relationship between schizophrenia and religion and its implications for care. *Swiss Medical Weekly, 134*(25–26), 369–376. https://doi.org/10.4414/smw.2004.10322

Moreira, A. A., & Cardeña, E. (2011). Differential diagnosis between non-pathological psychotic and spiritual experiences and mental disorders: A contribution from Latin American studies to the ICD-11. *Brazilian Journal of Psychiatry, 33*(1), S29–S36.

Moreira, A. A., Neto, F. L., & Cardeña, E. (2008). Comparison of Brazilian spiritist mediumship and dissociative identity disorder. *Journal of Nervous and Mental Disease, 196*(5), 420–424.

Moskowitz, A., Dorahy, M. J., & Schäfer, I. (2019). *Psychosis, trauma and dissociation: Evolving perspectives on severe psychopathology*. John Wiley & Sons. https://doi.org/10.1002/9781118585948

Murray, R. M., Oon, M. C., Rodnight, R., Birley, J. L., & Smith, A. (1979). Increased excretion of dimethyltryptamine and certain features of psychosis: A possible association. *Archives of General Psychiatry, 36*(6), 644–649. https://doi.org/10.1001/archpsyc.1979.01780060034003

National Center for Biotechnology Information. (2019). *Neurobiology of schizophrenia*. National Library of Medicine. https://www.ncbi.nlm.nih.gov/books/NBK546579/

Negro Jr, P. J., Palladino-Negro, P., & Louzã, M. R. (2002). Do religious mediumship dissociative experiences conform to the sociocognitive theory of dissociation?. *Journal of Trauma & Dissociation*, *3*(1), 51-73.

Nishimura, K. (1978). Shaman bunks to seisin iryo [Shamanistic culture and psychiatric cures]. In *Bunka to Seishinbyori* [Culture and psychopathology]. Kobundo.

Nishimura, K. (1987). Shamanism and medical cures. *Current Anthropology, 28*(S4), S59–S64. https://doi.org/10.1086/203589

Noll, R. (1983). Shamanism and schizophrenia: A state-specific approach to the "schizophrenia metaphor" of shamanic states. *American Ethnologist, 10*(3), 443–459. https://doi.org/10.1525/ae.1983.10.3.02a00030

Oohashi, T., Kawai, N., Honda, M., Nakamura, S., Morimoto, M., et al. (2002). Electroencephalographic measurement of possession trance in the field. *Clinical Neurophysiology, 113*(3), 435–445. https://doi.org/10.1016/S1388-2457(02)00002-0

Peres, J. F., Moreira, A., Caixeta, L., Leao, F., & Newberg, A. (2012). Neuroimaging during trance state: A contribution to the study of dissociation. *PLOS ONE, 7*(11), e49554. https://doi.org/10.1371/journal.pone.0049554

Petersen, L., Jeppesen, P., Thorup, A., et al. (2005). A randomized multicentre trial of integrated versus standard treatment for patients with a first episode of psychotic illness. *BMJ, 331*, 602–608. https://doi.org/10.1136/bmj.38565.415000.E01

Pietkiewicz, I. J., Kłosińska, U., & Tomalski, R. (2021 a). Delusions of possession and religious coping in schizophrenia: A qualitative study of four cases. *Frontiers in Psychology, 12*, 628925. https://doi.org/10.3389/fpsyg.2021.628925

Pietkiewicz, I. J., Kłosińska, U., Tomalski, R., & Van der Hart, O. (2021 b). Beyond dissociative disorders: A qualitative study of Polish Catholic women reporting demonic possession. *European Journal of Trauma & Dissociation*. Advance online publication. https://doi.org/10.1016/j.ejtd.2021.100204

Rummel-Kluge, C., & Kissling, W. (2008). Psychoeducation for patients with schizophrenia and their families. *Expert Review of Neurotherapeutics, 8*(7), 1067–1077. https://doi.org/10.1586/14737175.8.7.1067

Seda, D. A. (2021). Mediumship and mental health: Investigating spirit communication and the importance of integration. *Tech Neurosurg Neurol, 4*(4), Article TNN.000593. https://doi.org/10.31031/TNN.2021.04.000593

Seligman, R. (2005). From affliction to affirmation: Narrative transformation and the therapeutics of Candomblé. *Transcultural Psychiatry, 42*(2), 272–294. https://doi.org/10.1177/1363461505052670

Sharma, P., Mahapatra, A., & Gupta, R. (2022). Meditation-induced psychosis: A narrative review and individual patient data analysis. *Irish Journal of Psychological Medicine, 39*(4), 391–397. https://doi.org/10.1017/ipm.2019.47

Siddle, R., Haddock, G., Tarrier, N., & Faragher, E. B. (2002). Religious delusions in patients admitted to hospital with schizophrenia. *Social Psychiatry and Psychiatric Epidemiology, 37*(3), 130–138. https://doi.org/10.1007/s001270200000

Steffen, S. (2004). Delusion and the role of culture in understanding it. *Psychopathology, 58*(2), 171–174. https://doi.org/10.1027/1901-2276.58.2.171

Szasz, T. (1961). *The myth of mental illness*. Harper-Hoeber.

Tajima-Pozo, K., Zambrano-Enriquez, D., de Anta, L., Morón, M. D., Carrasco, J. L., López-Ibor, J. J., et al. (2011). Practicing exorcism in schizophrenia. *BMJ Case Reports, 2011*, bcr1020092350. https://doi.org/10.1136/bcr.10.2009.2350

Ventriglio, A., Bonfitto, I., Ricci, F., Cuoco, F., & Bhavsar, V. (2018). Delusion, possession and religion. *Nordic Journal of Psychiatry, 72*(S1), S13–S15. https://doi.org/10.1080/08039488.2018.1525639

Journal of Scientific Exploration
Anomalistics and Frontier Science

ESSAY

Some Chemical Mechanisms Involved in the Formation of Anomalous Pigmented Birthmarks in Cases of the Reincarnation Type

Benjamin T. Hendel
bthendel@gmail.com
Independent Researcher

HIGHLIGHTS

Ian Stevenson is known for his work studying young children who claim to remember past lives. A common feature of the cases he studied was the presence of birthmarks on the children that seemed to correspond to wounds (often fatal wounds) sustained in the previous lives they claimed to remember. Here, we enumerate some chemical mechanisms likely involved in the formation of these anomalous birthmarks based on a contemporary understanding of micro-PK (consciousness's ability to influence the outcome of probabilistic quantum mechanical events) and relevant aspects of developmental biology. We suggest two experiments that can be conducted to understand better how consciousness can influence the formation of pigmented birthmarks.

SUBMITTED May 28, 2024
ACCEPTED November 6, 2024
PUBLISHED October 15, 2025

https://doi.org/10.31275/20253455

PLATINUM OPEN ACCESS

ABSTRACT

In Ian Stevenson's time, little was known about the formation of pigmented birthmarks. Today, this is no longer true due in part to advances made to understand better and combat melanoma, an aggressive form of skin cancer that forms from melanocyte cells (which give the skin pigment and form pigmented birthmarks). Here, we summarize what is now known about the circumstances surrounding the formation of pigmented birthmarks during fetal development and some relevant work on micro-PK and its role in biology. We then enumerate some chemical mechanisms that are likely involved in the formation of anomalous pigmented birthmarks in cases of the reincarnation type. These mechanisms include the radical-pair mechanism, which has been the focus of much attention in quantum biology, as well as potential quantum computations occurring in various cytoskeletal filaments. All of the mechanisms enumerated here potentially alter the motion of migrating melanocyte and melanocyte precursor cells during pigmented birthmark formation based on the results of many simultaneous probabilistic quantum mechanical events. We theorize that micro-PK should be able to act on these probabilistic quantum events and thus exert influence on the motion of the migrating cells. We propose two experiments to further investigate the effects of consciousness on the motion of migrating melanocyte and melanocyte precursor cells.

KEYWORDS

cases of the reincarnation type, radical-pair mechanism, quantum biology, consciousness, survival.

INTRODUCTION

Ian Stevenson is known for his work studying children who claim to remember past lives. A noteworthy feature of many of the cases that he studied is the presence of birthmarks and birth defects on the children corresponding to injuries (often fatal injuries) sustained, allegedly, by their previous personalities (Tucker, 2008). A common type of reincarnation-related birthmark is hyperpigmented nevi (Stevenson, 1993), which is of the pigmented[1] variety (McLaughlin et al., 2008). From a theory development standpoint, these birthmarks are of considerable interest. If actual reincarnation occurs in these cases– if a human consciousness leaves a body to reattach later to a developing fetus– then these birthmarks are a clear example of consciousness directly affecting a biological process.[2] Understanding the mechanisms enabling this, which are better at detecting micro-PK influences than any instrument developed by science so far, will likely lead to a better overall understanding of micro-PK and its role in biological processes, including but not limited to cognitive control and cognition.

In a 1993 paper, Ian Stevenson wrote that "almost nothing is known about why pigmented birthmarks (moles or nevi) occur in particular locations of the skin" (Stevenson, 1993, p. 403). At the time, this statement was true. In Stevenson's day, a general lack of scientific understanding of the mechanisms involved in the formation of pigmented birthmarks precluded attempts by theorists to render a reductionist description of how anomalous birthmarks in cases of the reincarnation type might arise. In the ensuing decades, relevant areas of science have advanced considerably, and this is no longer the case today. Here, we discuss some chemical mechanisms that are likely involved in the formation of anomalous pigmented birthmarks in cases of the reincarnation type: the radical-pair mechanism and quantum processes occurring inside various cytoskeletal filaments.

While our analysis here focuses on pigmented birthmarks exclusively, vascular birthmarks are common in the literature (Stevenson, 1997a). It should be noted that the birthmarks that appear in cases of the reincarnation type are quite different than birthmarks that appear on members of the general population. In Stevenson's words, the birthmarks tend to be "hairless areas of puckered, scar like tissue, often raised above surrounding tissues or depressed below them; a few are areas of decreased pigmentation. [...] Those that resemble nevi and moles in appearance are often larger than "ordinary" nevi and also often occur in unusual locations" (Stevenson, 1997b, p. 3). The analysis undertaken here applies contemporary parapsychological theory to developmental biology to explain how melanocyte cells in anomalous birthmarks with pigmented components come to reside at their final location.

We will begin by discussing how micro-PK might produce effects in biological systems, specifically in the brain, where probabilistic quantum events in microtubules (Hameroff, 2022) can exert a quantifiably large influence on network-level neural activity.[3] (Hendel, 2023). We provisionally examine micro-PK effects in biological systems through the lens of Lucadou's correlation matrix method experiments (Walach et al., 2020). Next, we summarize key findings relating to the role and methods of melanocyte migration in the formation of pigmented birthmarks (Bonaventure et al., 2013). Based on these findings, as well as an understanding of how micro-PK interacts with biological systems, we then enumerate some chemical mechanisms by which probabilistic quantum processes can potentially exert a large influence over the behavior of migrating melanocyte cells during pigmented birthmark formation. We argue that these mechanisms must be at least partially implicated in the formation of anomalous pigmented birthmarks in cases of the reincarnation type, even if micro-PK influences over them alone cannot totally account for anomalous birthmark formation. Lastly, we describe two experiments that can be performed to explore the sensitivity of migrating melanocyte cells to conscious intention. The line of reasoning we use here was anticipated, conceptually, by Matlock (2019), who came to similar conclusions regarding the role of PK in the formation of anomalous birthmarks in cases of the reincarnation type.

MICRO-PK AND BIOLOGY

At face value, Ian Stevenson's work suggests that human consciousness can exist separately from the brain and fundamentally is not an emergent property of interconnected neurons. Other categories of anomalous observations made by parapsychology suggest this too, such as clinical cases in which patients experiencing cardiac-arrest-induced out-of-body experiences can accurately perceive facts about their environment that they would be unable to perceive even if they were healthy and awake (Rivas et al., 2016). If consciousness is fundamentally separate from the brain, this fact severely constrains how the brain can operate. Since human behavior is driven by network-level neural activity, there must be something in the brain that consciousness can directly affect via

mind-matter interaction that ultimately converts its will into network-level neural activity.

A plausible candidate for such a consciousness-brain connection mechanism is quantum events occurring inside microtubules, which are thought to exert influence over the firing time of pyramidal neurons (Hameroff, 2022). So-called "noise" emanating from pyramidal neurons is known to play a role in many consciousness-related neural networks (Rolls & Deco, 2012). The sensitivity of a specific neural network to changes in the noise it consumes can be quantified using the "moments method", which is a standard technique in neuroscience for describing the average dynamics of stochastic neural networks (Hendel, 2023). It has been shown that the neural networks that make binary decisions in the brain can be especially sensitive to small changes in the noise that they consume under biologically realistic conditions.

Parapsychology has amassed a large amount of evidence suggesting that conscious attention and intention can influence the outcome of probabilistic quantum events entirely independently of efforts to demonstrate that such events are involved in consciousness in the brain. A significant portion of the text *Parapsychology: A Handbook for the 21st Century* (Cardeña et al., 2015) is devoted to chronicling these experimental efforts. While experiments on this subject are historically fraught with reproducibility issues (Stokes, 2015), a contemporary string of experiments utilizing Walter von Lucadou's "correlation matrix method" seems promising and might offer insight into the specific kinds of effects that consciousness can have on the outcome of random quantum events. In these experiments, Lucadou put volunteers in front of a computer screen displaying a ribbon whose motion is controlled by a random number generator and asked them to attempt to exert control over the direction of the ribbon using their minds (Walach et al., 2020). They were instructed to press the computer's "shift" keys repeatedly, which were programmed to trigger a random sampling of a quantum random number generator and use the result of the sampling to move the ribbon horizontally. Their goal was to carry out on-screen movement instructions to cause the ribbon to either move to the right, move to the left, or remain in the same position.

While the volunteers were attempting to do this, Lucadou recorded several "physical variables" related to the output of the random number generator (things like mean voltage output) and "psychological variables" related to volunteer performance (things like the number of "left" and "right" shift-key presses). At the end of each volunteer's experimental run, the same battery of tests was executed by a presumably non-conscious computer program to serve as a control dataset. For each data set, a "correlation matrix" tabulating correlations between each of the physical variables and each of the psychological variables was populated using Spearman's correlation formula. At the end of the experiment, the number of correlations exceeding an arbitrary but predefined significance threshold in each data set for each volunteer was counted. A nonparametric permutation test was then performed to determine if the total number of significant correlations in the experimental dataset was meaningfully greater than the total number of correlations in the control dataset. In a 2019 replication of this experiment involving 134 participants, it was found that the number of correlations in the experimental data set was greater, with a p-value of .0177. This is the fifth successful replication of this experiment (Walach et al., 2020), although some difficulty has been reported during other reproduction attempts (Walach et al., 2022).

Lucadou's "correlation matrix method" experiments paint micro-PK not as a causal force but as a force that induces correlations between the outcomes of random quantum processes and events occurring on a classical scale that are meaningful to humans (Walach et al., 2020). Never in Lucadou's experiments are the laws of quantum mechanics broken or bent. Every quantum process behaves in accordance with the probability distributions specified by the Schrödinger equation. Consciousness creates harmony among the independent random quantum processes in the experiment without necessarily inducing a correlation between them. Thus, the interaction of consciousness with physical systems requires no more or less energy than the system would consume in the absence of consciousness.

Lucadou's work is predated by theoretical work done by physicist Jean Burns, who rigorously investigated the possibility of explaining PK effects in terms of "reordering" the outcomes of random quantum events "within the limits of the uncertainty principle" (Burns, 2006). Burns hypothesized that micro-PK simply imposes order on the outcome of random quantum events within the bounds of the uncertainty principle. The reordering is constrained by the laws of quantum mechanics, and the "interaction" of consciousness with physical systems does not require consciousness to possess or impart any energy. Burns' work is markedly more mathematically rigorous than Lucadou's and will likely be useful in the future for formulating

mathematically precise models of the effects of micro-PK on biological systems.

Given the evidence that quantum events inside microtubules influence conscious behavior, the evidence that consciousness itself can influence the outcome of random quantum events, and various case studies that seem to show that consciousness can exist and function independently of the brain, a clear picture of the relationship between consciousness and the brain starts to emerge. It looks like consciousness exists separately from the brain and causes the brain to carry out its will by affecting the outcome of random quantum events occurring inside of it, which eventually sets network-level neural activity in motion. This idea can be traced back to the work of Eccles (1986) and Stapp (1993). A natural question to ask is: can consciousness influence other classical processes outside of the brain if quantum processes influence those processes' dynamics? Why is whatever seems to be going on in the brain special? Should not any classical process with dynamics dependent closely enough on the outcome of many random quantum events be susceptible to direct manipulation by consciousness? As we will later see, the dynamics of the pigmented birthmark formation process are driven to some extent by the outcome of random quantum events. This, we hypothesize, is why the anomalous pigmented birthmarks observed by Ian Stevenson can exist in the first place.

MECHANISMS OF PIGMENTED BIRTHMARK FORMATION

While no specific cause of the formation of pigmented birthmarks has been determined, a lot is known about the circumstances surrounding their formation. A prominent feature of young human fetuses is the neural tube, which eventually develops into the brain and spinal cord. A temporary structure of stem cells called the "neural crest" forms around the neural tube and houses cells that will eventually become melanocytes, cells that give the skin pigment. These cells, called "melanoblasts" in their pre-melanocyte state, migrate from the neural crest into the fetus's skin between weeks 6 and 8 of fetal development (Cichorek et al., 2013). Pigmented birthmarks present at the time of birth form as a result of anomalies in this migration process[4] (Cichorek et al., 2013; McLaughlin et al., 2008).

Both melanocyte migration and proliferation are well understood. Cancerous melanoma cells form from melanocyte cells, and the two types of cells are presumed to use similar mechanisms to move. Much of the work in this area has been done to better understand melanoma cells, which are notoriously mobile once they appear in the body. The most common modes of motility for both melanocyte and melanoma cells are amoeboid and mesenchymal migration (Bonaventure et al., 2013). The cells switch between these modes as needed. Both methods of locomotion are ultimately carried out by the cell's actin cytoskeleton, which assembles and disassembles itself to exert the force necessary to cause movement. In both modes, the assembly and disassembly of the actin cytoskeleton are controlled by Rho GTPase signaling proteins (Bonaventure et al., 2013), which is common in mobile cells in general (Spiering & Hodgson, 2011). For a summary of what is known about the mechanisms governing the proliferation of melanocyte cells, see Hirobe's (2011) review article on the subject.

QUANTUM PROCESSES IN CELL MIGRATION

The Radical-Pair Mechanism

It is a known fact that magnetic fields can influence some organic chemical reactions. The mechanism by which this influence is imparted has been named "the radical-pair mechanism". In chemistry, a *radical* is defined as a molecule with an unpaired electron. An introductory exposition of this mechanism can be found in Hore and Mouritsen's (2016) summary paper. In magnetosensitive organic reactions, pairs of radicals form as short-lived reaction intermediates. Each radical in the pair has an unpaired electron, and the spin states of the two electrons in each pair are quantum mechanically entangled when the pair is created. There are two relevant spin states that a radical pair can be in: the "singlet" state, in which the electrons have opposite spins, and the "triplet" state, in which the electrons have the same spin. As the reaction progresses, individual radical pairs transition between these two spin states rhythmically (generally at a rate in the megahertz range) as a result of *hyperfine interactions*, the interactions of the magnetic moments of atomic nuclei with the unpaired electrons.

Generally, it is the case in these kinds of reactions that radical pairs in the singlet state, as well as in a superposition of both spin states, can potentially revert to the previous reaction step, and pairs in either spin state can potentially continue to the next reaction step (Kominis, 2015). The inability of triplet pairs to revert to their previous state is ultimately due to the Pauli Exclusion Principle. Thus, increasing the number of radical pairs in the triplet

state will make the reaction produce its product faster. External magnetic fields oscillating at the correct frequency increase the number of radical pairs in the triplet state via Zeeman interactions (Hore & Mouritsen, 2016).

There is empirical evidence that a reaction with a radical-pair mechanism intermediate step takes place during generic cell migration and that the rate of this reaction has a significant influence on the behavior of the migrating cell. In a 2023 experiment by Vecheck et al., mouse fibroblast cells were subjected to a 50 μT static magnetic field and a 1.4 MHz oscillating magnetic field with a 10 μT amplitude, while a group of control cells was subjected only to a 50 μT static magnetic field. After seven days of incubation, the cells exposed to the oscillating magnetic field had clustered more than the control cells, forming groups with an average density of 23.5×10^{-4} Cell/μm^2 compared to 4.7×10^{-4} Cell/μm^2. The explanation for this observation, posited by the authors, is that the oscillating magnetic field sped up cell respiration in the migrating cells by influencing the rates of metabolic processes that use the radical-pair mechanism to produce reactive oxygen species.

While the ratio of singlet to triplet radical pairs oscillates predictably in reactions involving large quantities of molecules (Hore & Mouritsen, 2016), the behavior of an individual radical pair in a reaction is fundamentally quantum mechanical. Radicals probabilistically slip between the singlet and triplet states, and the probabilities of these state changes can be quantified. Formally, radical pairs are treated as an open quantum system. They are modeled as being continuously "observed" by neighboring molecules with a Lindblad-type equation (Kominis, 2015, III.E.). At every instant of the system's evolution, a "response from nature" (Stapp, 2015) is rendered to determine if the system should collapse into a singlet or triplet state or continue evolving in a superposition state. Micro-PK should be able to influence when this collapse occurs and the resulting state. When cast over every radical-pair reaction occurring in a group of migrating melanocyte cells for days on end, this influence could conceivably have a large impact on the final distribution of cells.

Quantum Computations In Cytoskeletal Filaments

Actin filaments, like microtubules, are one of the three main types of cytoskeletal filaments in eukaryotic cells. In addition to physically implementing movement during cell migration (Bonaventure et al., 2013), there is strong evidence that actin networks are involved in various kinds of information processing tasks (Adamatzky et al., 2024). The possibility that actin filaments perform quantum computations like their microtubule cousins has been partially explored. Theoretically, classical F-actin networks can implement XOR, AND-NOT, and OR gates when modeled as automata (Adamatzky, 2017). When quantum mechanical effects are thrown into the mix and individual actin proteins in a strand are allowed to be in a superposition of two deliberately unspecified states, three-valued logic gates can be realized (Siccardi & Adamatzky, 2016). The networks could take advantage of the quantum superposition states of individual actin proteins if the physical realization of such states is possible. There is currently no concrete evidence that quantum computations occur in actin networks.

A curious fact that may ultimately be relevant here is the striking similarity between melanocyte cells and neurons. Both types of cells are derived from pluripotent cells in the neural crest, and both types of cells share a sensitivity to many of the same signaling molecules. The similarities are so striking that it has been suggested that melanocyte cells can be used to create toy models of brain disorders such as Alzheimer's disease (Yaar & Park, 2012). It is possible that microtubules play a bigger role in the behavior and migration of melanocyte cells than is currently known. Evidence shows that microtubules align pigments in melanophore cells (McNiven et al., 1984; Murphy & Tilney, 1974), and perhaps the microtubule scaffolding that exists for this purpose does something interesting from a quantum computing perspective. The mechanism that allows consciousness to influence the brain might be partially responsible for allowing consciousness to influence birthmark formation, although this is still only speculation.

DISCUSSION

It is possible to conclude that consciousness can exert some kind of influence over the outcome of probabilistic quantum events simply by acknowledging the existence of aforementioned consciousness-related anomalies and looking into the physical mechanisms involved in consciousness-related brain activity. Nonetheless, decades worth of micro-PK experiments suggest independently of these anomalies that consciousness can influence the outcome of probabilistic quantum events any time these events are sampled and used to create a meaningful change perceptible to the unaided human senses. Devices that record or display the outcome of random quantum events have been a staple of micro-PK research since pioneering work in the

area in the 1960s and 1970s, and many significant results have been obtained in experiments using them (Varvoglis & Bancel, 2015). It follows from this that any biological mechanism that magnifies the outcome of probabilistic quantum events into perceptible classical events should be able to be influenced by micro-PK. Furthermore, any biological process whose outcome is easily perceptible and partially influenced by random quantum processes should only be influenceable by micro-PK to the extent that the outcome of the biological process is determined by said random quantum processes. For example, network-level neural activity in the human brain is likely very sensitive to the outcome of probabilistic quantum events in microtubules (Hendel, 2023), so micro-PK should easily influence easily observable outcomes associated with brain activity, such as voluntary movement (see Figure 1a).

The chemical mechanisms discussed here influence melanocyte cell distribution based on the outcome of probabilistic quantum mechanical (QM) events (see Figure 1b). The degree to which the outcome of these probabilistic events affects the outcome of the biological process being considered, pigmented birthmark formation, is markedly less than the degree to which probabilistic quantum events affect the outcome of the biological processes associated with conscious brain activity. Moreover, the chemical mechanisms enumerated previously may not be the only such mechanisms that inject quantum randomness into the pigmented birthmark formation process. Regardless, our total knowledge of micro-PK suggests that consciousness should be able to affect the formation of pigmented birthmarks by influencing the enumerated mechanisms. Based on Lucadou's work, we should expect to see this influence manifest itself not by flippant deviations from probability distributions prescribed by quantum mechanics but rather by a series of convenient quantum coincidences that bring about the observed effects but do not violate the laws of physics.[5]

It should be possible to directly evaluate the effect of micro-PK on melanocyte migration[6] even without a complete understanding of the underlying chemistry involved. The mechanisms governing the migration of melanocyte cells and their cancerous counterparts, melanoma cells, are regarded as being so similar that research on one cell type's migration mechanisms is often interpreted as applying to the other's (Bonaventure et al., 2013). Techniques were invented for melanoma research to create three-dimensional models of human skin to examine the movement of melanoma cells in the skin under various conditions (Haridas et al., 2017). It should be straightforward to prepare such a model, seed it with living melanoma cells, and then instruct a volunteer to attempt to influence the motion of the cells with their intention. The motion of melanocyte and melanoma cells is quite slow and occurs in time frames on the order of days. Prolonged concentration by experiment participants might be necessary to observe an effect. It cannot be known *a priori* what sorts of effects volunteers should be expected to be able

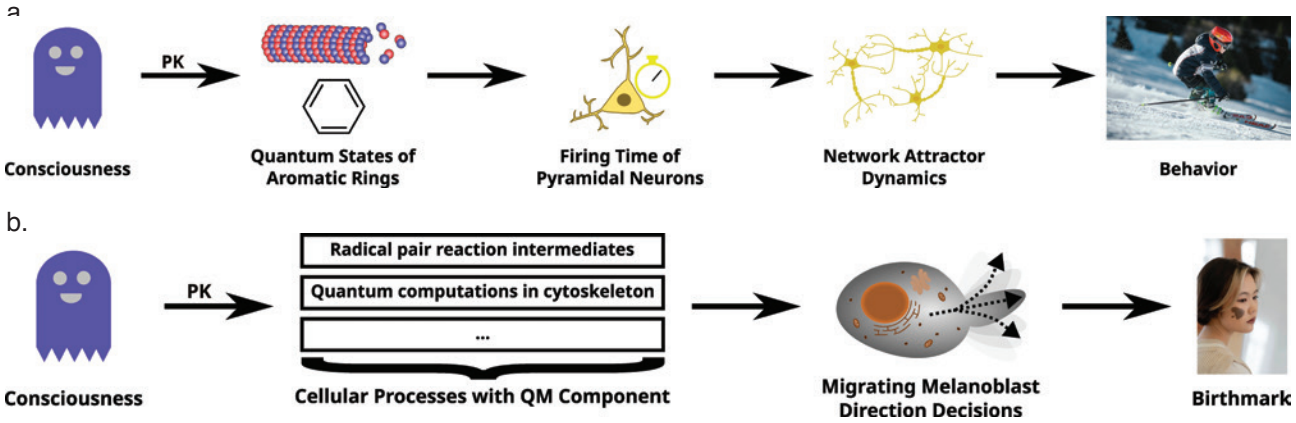


Figure 1. Causal Chains Involving Micro-PK. (a.) A plausible causal chain in which micro-PK effects are magnified by the brain to produce desired behavior. Micro-PK affects the states of electrons in the aromatic rings in the microtubules of pyramidal neurons, which in turn influences their firing times. When a micro-PK influence is cast over many pyramidal neurons simultaneously, the resulting effect on the state of behavior-related attractor networks can be approximated using the moments method (Hendel, 2023). (b.) A plausible causal chain in which micro-PK effects are magnified by quantum mechanical (QM) processes inside migrating melanoblast cells to influence their motion and final destination.

to produce in this kind of experiment. It might turn out, for example, that volunteers are only able to influence the distribution of cells and have little or no influence on their average direction of travel. Many different kinds of effects should be searched for.

Additionally, subjecting migrating melanoma cells in a three-dimensional model to an appropriate oscillating magnetic field could provide insight into what kinds of effects manipulating the spin states of electrons in radical pair reaction intermediates inside the cells might have on the cells' motion. Techniques similar to those used by Vecheck et al. (2023) could be used. In Vecheck's experiment, the target cells, fibroblasts, clustered more as a result of magnetic field exposure. This fact can't necessarily be used to make statements about melanoma cells, which might behave differently when their radical-pair reaction intermediates are tampered with. The effects of magnetic fields on cells, which change spin states *en masse*, are much different (and certainly much more dramatic) than the effects of micro-PK on cells. Micro-PK likely cannot alter the global numbers of singlet and triplet electron pairs in a given cell over a long period of time, as this would violate the laws of quantum mechanics. We can likely expect micro-PK to induce "happy coincidences" in which individual radical pairs just so happen to be in the right spin state at the right time (and behave totally probabilistically otherwise) to contribute to some larger effect ultimately brought about by an ensemble of micro-PK interactions throughout the entire collection of melanoma cells.

Future theoretical parapsychology work could focus on performing an analysis similar to the one performed here to better understand the effects of micro-PK on the development of vascular birthmarks as well as on other relevant aspects of fetal development. While some birthmarks implicated in cases of the reincarnation type certainly have pigmented components, it is clear that more is going on in these cases than just a disruption in melanocyte cell migration. Stevenson noted that some anomalous birthmarks "are bleeding or oozing when the baby is born" (Stevenson, 1997b, p. 3). There are cases in the literature in which birth defects are present in addition to or in place of anomalous birthmarks, and the totality of the evidence suggests that significant birth defects do not occur in cases when the reincarnating consciousness is not present in the early weeks of pregnancy (Matlock, 2019, Chapter 4). This suggests, perhaps, that many of the biological processes that take place in fetal development, particularly in the early stages, can be influenced by micro-PK in the same manner that we have proposed melanocyte cell migration can be influenced by micro-PK.

IMPLICATIONS AND APPLICATIONS

Nature is better at detecting micro-PK influences than we are. Today's parapsychologists struggle to create devices that consistently respond to conscious intent in a statistically significant way. There is certainly a lot to be learned from biology, which appears to have acquired through evolution the ability to detect micro-PK influences better than we currently can. Studying events inside the brains of awake animals is usually difficult (and expensive), so it is desirable to find other biological systems outside of the brain that are also sensitive to micro-PK influences and can be more easily examined. Ian Stevenson's work shows that melanocyte cells are such a biological system, and their melanoma cell derivatives are easy to work with in an experimental setting. Studying the chemical mechanisms involved in making melanocyte cells sensitive to micro-PK influences will improve our understanding of how biological systems, including the brain, capture these influences. Beginning to enumerate candidate micro-PK reception mechanisms in melanocyte cells and their precursors is a crucial first step toward realizing this objective. Additionally, any new information that can be learned about the effects of prolonged concentration on the migration and proliferation of melanoma cells has immediate and obvious medical applications.

ENDNOTES

1 The highest levels of classification for birthmarks not caused by abnormal development are *vascular* and *pigmented* (McLaughlin et al., 2008). Vascular birthmarks are made of blood vessels, and pigmented birthmarks are made of melanocyte cells.

2 Somehow, the information contained within a reincarnating consciousness gets imprinted on a developing fetus in cases involving anomalous birthmarks. Perhaps the reincarnating consciousness is present in the womb during fetal development and is actively ruminating about its previous death. Alternatively, the imprint, while ultimately originating from the experience of the reincarnating consciousness, might be imparted by some more subtle, almost subconscious means. Regardless, these cases are still instances of consciousness directly affecting a biological system.

3 The author does not endorse (or outright reject) Orch OR theory. All references to the theory here are made

solely in regard to the empirical evidence that the theory's supporters use to justify it.

[4] Specifically, congenital melanocytic nevi are thought to be caused by anomalies in the migration of melanoblasts in the neural crest itself. Dermal melanosis (or "Mongolian spots") is caused by melanocyte cells getting trapped in the skin during migration (McLaughlin et al., 2008).

[5] It would be just as problematic for consciousness to induce correlations between theoretically independent quantum events as it would be for consciousness to bias a number of quantum events to the extent that their outcome no longer conforms to the probability distribution(s) prescribed by quantum mechanics. The "problem" of causing a macro-level effect with micro-PK is akin, in a way, to solving a large Sudoku puzzle. The effect must be realized, but unnatural correlations between any pair of quantum events cannot be induced, and the results of all wave function collapses involved must conform to their prescribed probability distributions. Thankfully, nature seems to "solve" this problem automatically, almost as if some action integral is implicitly being minimized.

[6] It would be interesting if a convincing case of the reincarnation type could be produced involving pigmented birthmarks in which the time between death and birth is less than or equal to approximately 32 weeks. Since melanoblast migration takes place between 6 and 8 weeks of fetal development (Cichorek et al., 2013), and a normal pregnancy is about 40 weeks, a pigmented birthmark in such a case could not be the result of consciousness influencing melanoblast migration. In such an instance, quantum mechanisms involved in the proliferation of melanocytes already in the epidermis would presumably be the primary micro-PK targets.

REFERENCES

Adamatzky, A. (2017). On the dynamics of excitation and information processing in F-actin: Automaton model. *Complex Systems*, *26*(4), 295–318. https://doi.org/10.25088/complexsystems.26.4.295

Adamatzky, A., Schnauß, J., & Tuszyński, J. (2024). Chapter 1: Actin. In *Actin Computation Unlocking the Potential of Actin Filaments for Revolutionary Computing Systems*. Essay, World Scientific. https://www.worldscientific.com/doi/10.1142/9789811285073_0001

Bonaventure, J., Domingues, M. J., & Larue, L. (2013). Cellular and molecular mechanisms controlling the migration of melanocytes and melanoma cells. *Pigment Cell & Melanoma Research*, *26*(3), 316–325. https://doi.org/10.1111/pcmr.12080

Burns, J. E. (2006). The arrow of time and the action of the mind at the molecular level. *Frontiers of Time (AIP Conference Proceedings)*, *863*, 75–88. https://doi.org/10.1063/1.2388749

Cardeña, E., Marcusson-Clavertz, D., & Palmer, J. (2015). *Parapsychology: A Handbook for the 21st Century*. McFarland.

Cichorek, M., Wachulska, M., Stasiewicz, A., & Tymińska, A. (2013). Skin melanocytes: Biology and Development. *Advances in Dermatology and Allergology*, *1*, 30–41. https://doi.org/10.5114/pdia.2013.33376

Eccles, J. C. (1986). Do mental events cause neural events analogously to the probability fields of quantum mechanics? *Proceedings of the Royal Society of London. Series B. Biological Sciences*, *227*(1249), 411–428. https://doi.org/10.1098/rspb.1986.0031

Hameroff, S. (2022). Consciousness, cognition and the neuronal cytoskeleton – a new paradigm needed in neuroscience. *Frontiers in Molecular Neuroscience*, *15*. https://doi.org/10.3389/fnmol.2022.869935

Haridas, P., McGovern, J. A., McElwain, S. D. L., & Simpson, M. J. (2017). Quantitative comparison of the spreading and invasion of radial growth phase and metastatic melanoma cells in a three-dimensional human skin equivalent model. *PeerJ*, *5*. https://doi.org/10.7717/peerj.3754

Hendel, B. (2023). Approximating the effect of consciousness on stochastic brain structures. *Journal of Scientific Exploration*, *37*(1), 59–66. https://doi.org/10.31275/20232597

Hirobe, T. (2011). How are proliferation and differentiation of melanocytes regulated? *Pigment Cell & Melanoma Research*, *24*(3), 462–478. https://doi.org/10.1111/j.1755-148x.2011.00845.x

Hore, P. J., & Mouritsen, H. (2016). The radical-pair mechanism of magnetoreception. *Annual Review of Biophysics*, *45*(1), 299–344. https://doi.org/10.1146/annurev-biophys-032116-094545

Kominis, I. K. (2015). The radical-pair mechanism as a paradigm for the emerging science of Quantum Biology. *Modern Physics Letters B*, *29*(Supplement 1), 1530013. https://doi.org/10.1142/s0217984915300136 https://arxiv.org/abs/1512.00450

Matlock, J. G. (2019). *Signs of reincarnation: Exploring beliefs, cases, and theory*. Rowman & Littlefield.

McLaughlin, M. R., O'Connor, N. R., & Ham, P. (2008). Newborn skin: Part II. Birthmarks. *American Family Physician*, *77*(1), 56–60. https://pubmed.ncbi.nlm.nih.gov/18236823/

McNiven, M. A., Wang, M., & Porter, K. R. (1984). Microtubule polarity and the direction of pigment transport reverse simultaneously in surgically severed melanophore arms. *Cell*, *37*(3), 753–765. https://doi.org/10.1016/0092-8674(84)90411-2

Murphy, D. B., & Tilney, L. G. (1974). The role of microtubules in the movement of pigment granules in teleost melanophores. *The Journal of Cell Biology*, *61*(3), 757–779. https://doi.org/10.1083/jcb.61.3.757

Rivas, T., Dirven, A., Smit, R. H., Holden, J. M., & Boeke, W. (2016). *The self does not die: Verified paranormal phenomena from near-death experiences*. IANDS Publications.

Rolls, E. T., & Deco, G. (2012). *The noisy brain: Stochastic dynamics as a principle of brain function*. Oxford University Press.

Siccardi, S., & Adamatzky, A. (2016). Quantum actin automata and three-valued logics. *IEEE Journal on Emerging and Selected Topics in Circuits and Systems*, *6*(1), 53–61. https://doi.org/10.1109/jetcas.2016.2528722

Spiering, D., & Hodgson, L. (2011). Dynamics of the rho-family small GTPases in actin regulation and motility. *Cell Adhesion & Migration*, *5*(2), 170–180. https://doi.org/10.4161/cam.5.2.14403

Stapp, H P. (2015). A Quantum-Mechanical Theory of the Mind/Brain Connection. In *Beyond Physicalism: Toward reconciliation of science and spirituality*. Essay, Rowman & Littlefield.

Stapp, H P. (1993). *Mind, Matter, and Quantum Mechanics*. Springer-Verlag. https://doi.org/10.1007/978-3-662-08765-7

Stevenson, I. (1993). Birthmarks and Birth Defects Corresponding to Wounds on Deceased Persons. *Journal of Scientific Exploration*, *7*(4), 403–410.

Stevenson, I. (1997a). *Reincarnation and Biology: A Contribution to the etiology of birthmarks and birth defects*. Praeger.

Stevenson, I. (1997b). *Where reincarnation and biology intersect*. Praeger.

Stokes, D. M. (2015). The Case Against Psi. In *Parapsychology A Handbook for the 21st Century*. Essay, McFarland.

Tucker, J. B. (2008). Ian Stevenson and Cases of the Reincarnation Type. *Journal of Scientific Exploration*, *22*(1), 36–43. https://journalofscientificexploration.org/index.php/jse/article/view/168/103

Varvoglis, M., & Bancel, P. A. (2015). Micro-Psychokinesis. In *Parapsychology a Handbook for the 21st Century*. Essay, McFarland.

Vecheck, A. M., McNamee, C. M., Reijo Pera, R., & Usselman, R. J. (2023). Magnetic field intervention enhances cellular migration rates in biological scaffolds. *Bioengineering*, *11*(1), 9. https://doi.org/10.3390/bioengineering11010009

Walach, H., Horan, M., Hinterberger, T., & von Lucadou, W. (2020). Evidence for anomalistic correlations between human behavior and a random event generator: Result of an independent replication of a micro-PK experiment. *Psychology of Consciousness: Theory, Research, and Practice*, *7*(2), 173–188. https://doi.org/10.1037/cns0000199

Walach, H., Kirmse, K. A., Sedlmeier, P., Vogt, H., Hinterberger, T., & Von Lucadou, W. (2022). Nailing jelly: The replication problem seems to be insurmountable. Two failed replications of the Matrix Experiment. *Journal of Scientific Exploration*, *35*(4), 788–828. https://doi.org/10.31275/20212031

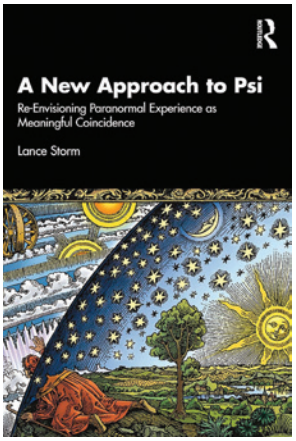
Yaar, M., & Park, H.-Y. (2012). Melanocytes: A window into the nervous system. *Journal of Investigative Dermatology*, *132*(3), 835–845. https://doi.org/10.1038/jid.2011.386

Journal of Scientific Exploration
Anomalistics and Frontier Science

BOOK AND MULTIMEDIA REVIEW

A New Approach to Psi: Re-envisioning Paranormal Experience as Meaningful Coincidence

Sharon Hewitt Rawlette
The Mind & Meaning Institute
sharon.rawlette@gmail.com
sharon.rawlette@mindmeaninginstitute.com



Lance Storm (2025). *A New Approach to Psi: Re-envisioning Paranormal Experience as Meaningful Coincidence*. Routledge.

ISBN 978-1-032-91097-0

https://doi.org/10.31275/20253801

PLATINUM OPEN ACCESS

Lance Storm's *A New Approach to Psi* defends the thesis that parapsychology ought to abandon the idea of psi as a causally mediated ability and instead re-conceptualize it as a form of synchronicity, which psychiatrist Carl G. Jung (2010) famously characterized as an "acausal connecting principle" governed by the archetypes of the collective unconscious. Over the course of slightly more than two hundred pages, divided into five chapters, Storm examines the wide range of difficulties currently dogging psi research and argues that adopting a Jungian view of psi would enable researchers to better understand these difficulties and formulate solutions.

Storm begins, in the book's first chapter, by describing early parapsychological research, such as that of J. B. Rhine, and illustrating some of the assumptions and confusions that have characterized the field since its inception. Storm highlights, for instance, the confused ways in which the term 'psi' has been used. It's sometimes employed merely as a collective term for extrasensory perception (ESP), psychokinesis (PK), and other anomalous phenomena, but at other times, it's used to refer to some underlying unitary process that's taken to *explain* phenomena such as ESP and PK. Storm ultimately argues that ESP and PK can't be clearly distinguished in the lab and that it makes sense to formulate a theory of psi as a unitary process underlying them both, though the thread of his logic is at times hard to follow.

Storm intertwines his discussion of the idea of psi as a unitary process with his argument against the common assumption that psi always has a causal source, and that this source is an agent or observer (or a group of agents or observers). Storm turns the reader's attention here to the phenomenon of synchronicity and points out that "many cases of synchronicity are too complex structurally (temporally, spatially, agentively, and contextually) for us to accept that a causal agent/observer was completely or even mostly responsible" (p. 38). Storm cites a couple of examples of such structurally complex synchronicities in the writings of Charles Tart (2008) and Dean Radin (2018), but my own favorite example of the difficulty of finding a point of origin for synchronistic phenomena comes from Kirby Surprise.

Surprise (2012, pp. 13–14) tells about a situation in which he was waiting in his car to pick up a friend when he heard a radio promotion for the Stephen King movie *Carrie*. Surprise had already seen the movie, in which a teenage girl crushes her house with the power of her mind. Across the street from where Surprise was parked, there was an old house, and Surprise started thinking about what it would be like to use his mind to tip over such an immense object. As he was thinking about this, the house actually began to tip toward him, its roof falling toward the ground and ending up facing him. Surprise,

astonished but undeterred, told himself that he now wanted to see the house crushed, like it was in the movie. Sure enough, the house began to implode. And, as it did so, a bulldozer became visible, crawling from behind the house over the wreckage.

At first glance, it might seem like this event was the direct psychic result of Surprise's stated desire, but there are complicating factors. If the world were responding directly to Surprise's desire, it seems it would have had to do so *before* his desire came into existence: by causing the demolition of the house to be scheduled on that particular day and by causing Surprise's friend to ask for a lift at just the right time to allow Surprise to witness it. Furthermore, Surprise's desire didn't spring from nowhere. It was caused by the radio ad for the movie, which was caused by the fact that the movie was playing in theaters at that particular time.

When we look at the full array of events connected to this synchronicity, it seems less like Surprise's desire was the source of the synchronicity and more like his desire was just one of many orchestrated elements. And, though Storm himself doesn't mention this particular case, it does precisely illustrate another point of his: that many of the decisions individuals make are ultimately steered by the synchronistic depths of the collective unconscious. Storm writes,

> A *transcendent* experience could be in the 'backyard' of the deeper realms of the unconscious, with individuals clearly but merely occupying roles, meaning that many decisions they make will be governed by that state and will only be *thought of* as acts of volition. (p. 49)

In Surprise's case, the source of his experience of mentally crushing a house wasn't just in the *metaphorical* backyard of the unconscious, but in a very literal backyard as well! And Storm's ultimate point is that *all* psi occurs in this way—orchestrated by factors deeper, less personal, and less straightforwardly causal than parapsychologists have assumed.

In the second and third chapters of the book, Storm turns to evaluating some of the explanations that parapsychologists have given for the difficulty of creating robust demonstrations of psi in the laboratory. They've appealed, for instance, to experimenter psi and the decline effect, both of which Storm argues are not very persuasive phenomena when one looks closely at the experimental data. Storm titles the second and third chapters "The Trickster in Parapsychology: Part I" and "The Trickster in Parapsychology: Part II," due partly to the fact that parapsychologists often refer to experimenter psi and decline effects as part of the "Trickster-like" nature of psi. It's not clear to what extent parapsychologists who make such remarks actually consider archetypes like the Trickster to be influential in the workings of science (rather than merely a fanciful manner of personifying frustrations in the laboratory), but Storm himself clearly sees the Trickster as a real live influence, and as one that has doubly hoodwinked parapsychologists—by leading them to believe these "tricky" experimental effects exist even though the data, viewed more carefully and objectively, don't provide convincing evidence for them. Storm also sees the Trickster at play in the domain of various questionable research practices and the difficulty of grappling with false positives and false negatives.

What is clear—to both Storm and the parapsychology community in general—is that, whatever may be going on in psi phenomena, psi researchers have not yet uncovered a way of reliably producing large effect sizes in the laboratory. If the ability-based, straightforwardly causal model of psi were correct, it seems we ought to have made significant progress in this area. Storm views the fact that we haven't made such progress as pointing to a fundamental lack of understanding about what psi phenomena are and why they exist. And this is the gap that Storm wishes to fill with his new vision of psi as synchronicity.

Storm's fourth chapter goes into some detail describing his psi-as-synchronicity hypothesis and laying out parallels with other existing theories of psi while also highlighting differences. Storm looks at Psi-Mediated Instrumental Response Theory, Meaningful Information Creation, psychopraxia, Decision Augmentation Theory, the Model of Pragmatic Information, Archetypal Synchronistic Resonance, the Multiphasic Model of Precognition/Informational Psi, and First Sight Theory. Many of these see psi as meaning-based and unitary, but only one invokes archetypes, which, for Storm, are crucial to understanding the operation of psi as synchronicity.

For Storm, as for Jung, synchronicity is bound up in meaning, affect, and even "numinosity"—that intersection of meaning and affect that we experience in feelings of profound mystery and awe. Crucially, however, Storm and Jung take the meaning, affect, and numinosity experienced in synchronicity to be derived from "archetypes" and their acausal "constellation" (that is, activation or manifestation), not only in human minds and lives but in the

non-human and even non-biological realms as well. Storm cites F. David Peat's description of synchronicity as "a microcosm which reflects the dynamics of the macrocosm as it unfolds simultaneously into the mental and material aspects of a person's life" (Peat, 1987, p. 187; quoted in Storm, 2025, p. 45).

Storm returns repeatedly to the assertion that archetypes constellate unpredictably, independently of human desire or intention, and that this helps to explain why psi in the laboratory remains erratic and psi research has made so little progress beyond demonstrating the presence of some fairly small effect sizes. Storm writes, "with psi it is thought the external world is beholden to human whim, whereas synchronistic outcomes are indeterminate and statistically dependent upon archetypal and environmental factors" (p. 46). Storm sees the agent of synchronicity—and, by extension, of psi—as something more holistic and comprehensive than a single individual's intentions, feelings, or conceptions of meaning. He writes, "We can see how there is an interplay between what the individual wills (intends) and something 'other', and this interplay paints a bigger, more dynamic (synchronistic) picture of psi" (p. 49).[1]

Psi researchers, Storm asserts, have ignored the significant role of archetypes and archetypal resonance in their experiments, to their detriment. Storm writes, "Under the principle of synchronicity, ... a psi hit (e.g., 'equivalence' in synchronicity) is only ever an approximate *correspondence*, not to a target, but to archetypal content *represented* in the target (or even from some other source such as a decoy)" (p. 164). Experiments with psi can be baffled if the experimenters are not aware that hits manifest as a result of how a target connects to a subject's "complexes": to the archetypal themes that are currently significant and important to them. Experiments need to be designed to facilitate archetypal resonance only with the intended targets and to discourage inadvertent resonance with decoys. Merely telling a subject which psi target to focus on will not be enough if their psyche is deeply drawn to an alternative. Focusing on the wrong target will show up as psi missing unless experimenters specifically design their experiments to account for the possibly subversive influence of archetypal resonance.

I was surprised that, although recognition of the influence of archetypes returns over and over as the central piece that Storm believes is missing from current psi research, the book offers no detailed exploration of what archetypes are or where they come from. The most detail Storm provides on this subject is in a paragraph on page 34:

> Jung ... describes archetypes as nodal points or structural components of the collective unconscious (deep in the mind) that govern or influence our "patterns of behaviour" .... In other words, archetypes play a pivotal role in how we think, feel and act. They are innate and inherited. From an evolutionary or hereditary point of view, archetypes have become so distinct and well-defined as human factors that govern whole ways of being, they can be depicted and observed as motifs or idealized characters in a cultural product (*though these are only ever representations*)—examples include Hero/Heroine, Wise Old Man/Woman, Child, and contra-sexual components of the hero and heroine (i.e., *anima* and *animus*, respectively). Other psychological constructs include the persona (one's social mask or public image), natural numbers, the ego, and the 'central archetype' or Self (Jung also spells it as "self"), which is sometimes referred to as 'higher self' to avoid confusion. While archetypes are indeterminate in number, one assumes there must be an upper limit.

Storm adds that "[a]n archetype forms the substructure of a synchronicity, giving it its common theme, and acting as a defining quality throughout the experience, thereby, intensifying the meaningfulness" (pp. 34–35). And he notes that success in psi research "is a matter of whether an *archetypal situation* can be set up based on *the psychology of the particular individual*" (p. 35, italics in the original).

I confess that, after finishing Storm's book—and even after having read a handful of other books by Jungian theorists—I am still confused as to what makes something an archetype, as opposed to, say, just an emotionally charged idea or concept. I imagine that many parapsychologists will feel similarly puzzled. What is the nature of these "archetypes," and by what sorts of rules do they operate? In most of the book, Storm focuses on archetypes that are psychological constructs, such as the Ego, the Self, the Shadow, the Anima, the Animus, the Child, the Hero/Heroine, and the Wise Old Woman/Man. But then, when discussing a synchronicity of his own, involving an electric fan, he says it's likely that an archetype such as "energy," "electricity," or "spinning wheels" was involved (p. 137). Elsewhere in the book, he mentions the archetype of "circularity" (p. 163), and in the passage quoted at length above, he mentions the "natural numbers" as archetypes. If things like

electricity, spinning wheels, circularity, and even numbers can be archetypes, I confess I have no idea what makes one idea an archetype rather than another. It seems like *anything* could be an archetype to the right person—even a Kleenex or a blade of grass.

While I happen to agree with Storm about the usefulness of conceptualizing psi as synchronicity, understanding synchronicity in terms of archetypes seems to me to introduce unnecessary confusion and ambiguity, and I believe it would make more sense to directly theorize about the roles of meaning and affect in psi and synchronicity. At one point, Storm offers the following formula: archetype + affect + numinosity + meaningfulness = synchronicity (p. 52). In the same paragraph, he says that "we could assume an archetypal influence if the presence of affect, numinosity, and meaningfulness are discernible" (p. 52). But do we *need* to? Mightn't these factors, on their own, be enough to power synchronicity? Assuming that there is something that differentiates an archetype from just any old idea or concept, isn't that thing precisely the concept's meaningfulness within our minds—its intense affective charge, to the point of numinosity? Might it not be the philosophical, psychological, and emotional resonance of a synchronicity that brings it into existence, rather than its connection to some independent thing like an archetype? Speaking of "archetypes" could turn out to be a useful shorthand of sorts, but the real explanatory power would seem to lie in the meaningfulness that defines and powers the archetypes.

In fact, Storm does seem to allow that meaningfulness and affect modulate how an archetype constellates (i.e., manifests) in a particular case. He allows, for example, that two crossed lines might influence the synchronistic or psi experiences of a religious person, for whom it would evoke the archetype of the crucifix (p. 163), but that it probably won't activate this archetype for others. If this is the case, though, is the archetype really doing the work, or is it the individual's emotional resonance with the idea? Presumably, Storm sees both as necessary, but it's very unclear what the independent contribution of the archetype is supposed to be and what determines it.

That is my primary critique of Storm's book: the unnecessary complication of his archetypal understanding of synchronicity. But I had a few other concerns as well. One of the elements that sometimes made Storm's book difficult to follow was his lack of precision in expressing his ideas. For instance, on p. 93, he writes, "In science, including parapsychology, there is a burgeoning need for the concept of causality; it does not suffice to find evidence of an effect without knowing what caused the effect." This was a very confusing pronouncement to hear from someone who had already repeatedly stated that parapsychology needed to adopt an *acausal* conception of psi. After reading a bit further, I realized that what Storm meant to say was, "In science, including parapsychology, there is a burgeoning *felt* need for the concept of causality." Precise language makes all the difference between a book that's easy to follow and one that's not, and while some of Storm's passages are quite clear, the frequency of imprecisions like this is high enough to be irksome.

More troubling on a philosophical level was the fact that Storm seems to have a rather primitive understanding of causality, which makes it difficult to judge the value of his arguments about the acausal nature of synchronicity. He writes that "testing archetypes in the lab may ... be possible, but that will not make causes of them because they do not function like causes—put simply, they do not always deliver" (p. 96). But there are in fact very few "causes" that "always deliver"—very few causes that are *sufficient* causes, to use the philosopher's preferred terminology. Most causes deliver a particular effect only in a certain set of circumstances. For instance, striking a match may generally cause a flame, but only if the match is dry, if there is sufficient oxygen present in the surrounding air, etc. Causation involves the mutual interaction and influence of a large number of events and conditions, and the more complex these interactions, the more difficult it is to pin down the individual contributions of each variable and reliably produce a desired effect. The complexity of the affair doesn't mean, however, that causality is not at work.

In the end, while I agree with Storm that it makes sense to conceptualize psi and synchronicity as a single phenomenon, I don't think it's particularly helpful to characterize that phenomenon as "acausal." I think it's more useful to speak in terms of *nonlocal* causality—perhaps even *extratemporal* or *teleological* causality. If we believe it's possible to investigate how psi and synchronicity work, it's because we believe there *is* a how, that there is a method, a structural framework to these phenomena, and I would call that "causal," even if it's a causality rooted in the spatially and temporally nonlocal influence of meaning. This may, to some extent, be a semantic disagreement, but semantics is terribly important when one is striving to make a case for an unpopular and little-understood view, and Storm could have done a better job defining and defending his proposal with regard to the subject of causality, or the lack thereof.

Storm's book concludes with a chapter on quantum mechanics and its relationship to consciousness. I appreciated that Storm considered some of the meatier issues of interpreting quantum mechanical experiments—and corrected a prevalent misapprehension about the precise nature of the quantum experiments that have actually been conducted. It was a little hard to discern exactly how Storm's discussion of quantum mechanics related to the book's larger thesis, but ultimately his goal seemed to be to show that, while quantum phenomena may offer us some justified precedent for thinking about reality nonlocally, quantum mechanics alone does not solve the deepest puzzles about the nature of consciousness and doesn't involve any role for meaning or affect, which experience has shown to be central to the operation of both psi and synchronicity. Storm therefore concludes that, while quantum mechanics certainly adds importantly to our understanding of the world, an adequate theory of psi requires something more.

As will be clear by now, Storm identifies that something more as the meaningful, numinous, affect-laden constellation of archetypes that he sees demonstrated in the operation of synchronicity. While I'm doubtful that we need to invoke archetypes instead of focusing directly on the role that meaning and affect play in the nonlocal causal structure of our world—for the reasons I've given above—I'm nevertheless open to further exploration of the idea. And further exploration we will have, as Storm's follow-on volume, *A New Approach to Synchronicity*, is due out in March 2025.

ENDNOTE

[1] At the same time, Storm does think there is volition in synchronicity, that it is not merely impersonal teleology or "fate" at work (p. 143).

REFERENCES

Jung, C. G. (2010). *Synchronicity: An acausal connecting principle* (R. F. C. Hull, Trans.). Princeton University Press. https://doi.org/10.1515/9781400839162

Peat, F. D. (1987). *Synchronicity: The bridge between mind and matter*. Bantam.

Radin, D. (2018). *Real magic: Ancient wisdom, modern science, and a guide to the secret power of the universe*. Harmony.

Surprise, K. (2012). *Synchronicity: The art of coincidence, choice, and unlocking your mind*. New Page Books.

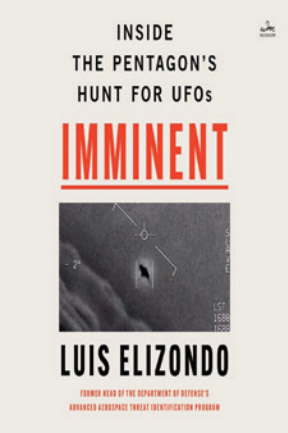
Tart, C. (2008). Causality and synchronicity: Steps towards clarification. In L. Storm (Ed.), *Synchronicity: Multiple perspectives on meaningful coincidence* (pp. 109–126). Pari Publishing.

Journal of Scientific Exploration
Anomalistics and Frontier Science

BOOK AND MULTIMEDIA REVIEW

Imminent: Inside the Pentagon's Hunt for UFOs

Paul H. Smith, PhD
(Major, US Army, ret.)
Seven-year alumnus of Project Star Gate
Two-time president, the International Remote Viewing Association
phsmith@rviewer.com



by Louis Elizondo
William Morrow, 2024
304 pp
Reviewed by Paul H. Smith, PhD (Major, US Army, ret.)

ISBN-13: 978-0063235564

https://doi.org/10.31275/20253795

Louis "Lue" Elizondo has a full dance card these days. The podcast, television, and radio airwaves have been burning up to meet the demands of so many people eager to hear his story. Perhaps that's exaggerated—but not by much. News of Elizondo's recently-released book, *Imminent: Inside the Pentagon's Hunt for UFOs*, and the interviews he has given to support that release have penetrated deeply into both the newsrooms and the living rooms of America. But the book has global reach, as well. In early November 2024, I saw *Imminent* prominently displayed in the window of a Budapest, Hungary bookstore.

Written in a popular style, *Imminent* is easily digestible. It eschews scientific jargon and theorizing, except in the most general but necessary way, and comes across as a fairly humble account of a quite extraordinary life. Of most interest to JSE readers would be Elizondo's seminal association with the Pentagon's AATIP UAP (UFO) investigation program and its successor(s). I'll say more later, but it's important to note that this book isn't *only* about that. To contain that core part of his story, Elizondo weaves a cocoon out of his life before and after. That alone is worth the price of the book.

Elizondo's first encounter with anything "paranormal" (with respect to the US government) involved an association with the late Gene Lessman, a veteran of the Star Gate remote viewing program (and a long-time friend of mine) who recruited Lue for a clandestine US Army intelligence cover program. As an off-the-books sidebar to this official relationship, Lessman also let Elizondo in on the existence of Star Gate, the final iteration of the military's psychic spy remote viewing program. Lessman then informally taught Elizondo remote viewing, intending to introduce him to the managers of the program as a potential recruit. Unbeknownst to Gene, who by then was no longer formally associated with the program, Star Gate was about to be cancelled by the cynical leadership of the CIA. That was perhaps fortuitous for the UAP saga. If Elizondo had been inducted into Star Gate, he may not have been available for later recruitment into the UAP program.

But what *about* those UAPs? The book does not disappoint. Elizondo's first inkling that anything was up in that domain—or that there was even anything worth *taking seriously* about UAPs—was when he was contacted by a man named Jay Stratton (now himself well-known in the UAP world) and asked to handle the counter-intelligence (CI) envelope protecting from prying eyes what Lue soon learned was the Department of Defense's program investigating UFOs.

As he describes his steep learning curve, Elizondo summarizes a substantial number of UFO events and reports, some famous, others obscure. The initial account he relates is the long string of occurrences in the vicinity of Colares, Brazil—encounters he first heard about at a business dinner he attended with his DoD associates, along with Robert

Bigelow, Hal Puthoff, and a Brazilian military officer, General Roberto Uchôa. Over the past ten years, the Colares events have become much more widely known, recently comprising a major portion of the first episode of George Knapp's new "Investigation Alien" documentary on Netflix. But in the world of ufology, Colares still counts as a recent revelation. Elizondo learned of these occurrences from the original sources and Brazilian authorities. The other events Elizondo describes span a time frame from the 1950s to the very recent.

But these are in the book as just a sampling. Interwoven are stories of his deepening influence within the top-secret UAP program, ending with his exit under protest from there into the world of civilian whistle-blowers. What *Imminent* brings to the table is useful detail for understanding the organizational and bureaucratic complications and maneuverings that have made "Disclosure" so difficult to accomplish. Indeed, the parts of the story where Elizondo reveals the legislative contortions, the back-channel deal-making, the promises kept and broken, the bureaucratic logjams and dead ends, may seem tedious to those seeking the newest, juiciest UAP and ET revelations. But it is the most important part of the book for those seeking to understand and—just maybe—influence the process, rather than simply be titillated and entertained, as seems to be the true goal of the most popular "Disclosure" communities.

If you pay attention to what Elizondo is saying, this is what you will learn: Thinking that the Government will finally cave in to disclosure demands, and simply hand each of us a binder neatly organized with verified case studies, autopsy photographs and complex engineering diagrams of real UAPs, all arranged in chronological order is as much a fantasy as some of the most extreme popular speculative claims about Pleidians, Zeta Reticuli and Lizard People.

Even this isn't the whole story. It's clear that there are things Elizondo can't yet talk about. When finally revealed, those details will, hopefully, bring a fuller understanding of the whole picture. Lue does engage in a bit of ax-grinding. There are folks that Elizondo doesn't name who purposely put up obstacles to the investigative process, continually trying to block any and all attempts to establish ground truth.

There are two exceptions to this anonymity that Elizondo is very happy to name: Intelligence community bureaucrat (and retired soldier) Garry Reid and Congressman Mike Turner. If their behavior was truly as egregious as *Imminent* makes it sound, then these two deserve whatever (figurative!) stones can be thrown at them. It's a shame that others just as—or even more—culpable can't receive the same treatment. This ax-grinding is understandable, even justified. Elizondo spells out the threats and reprisals taken against him, as well as the numerous ways that he was maligned, marginalized, and pressured not to step out of line, even when he had the best interests of the nation in mind.

Elizondo does lapse briefly into scientific speculation when he considers possible explanations for some of the observed characteristics of UAP appearances. Of particular note is a section where he considers how Hal Puthoff's theories about UAP propulsion fit into the framework of reported observations. These theories do correlate nicely, but correlation doesn't necessarily mean that's how things will turn out to be in the end. It's still likely that, if Elizondo (channeling his inner Puthoff) turns out to be wrong, the true principles behind UAP propulsion and other behaviors will nevertheless solve the problem in a similar way, once they're finally discovered.

No good book review is complete without including a few things to complain about. My first point is trivial, but a sore point for me: The confusion about the Star Gate Program's name. People, it is *two words*, with initial capitals! Written the wrong way, "Stargate" is a book, a movie, and a television series. "Star Gate" is the correct umbrella name for the Government's 23-year remote viewing program. It's a self-perpetuating error promulgated because the people who know better don't make enough of a fuss about it. So put me on record as making that fuss. I don't blame Elizondo for this. The mistaken usage is so widespread that I may be tilting at windmills to even bother protesting. But one must shout against the storm.

Okay, now to be a little more serious. One of the things that annoyed me about *Imminent* is the lack of attribution and sourcing. Maybe this was the publisher's choice to avoid footnoting. But there are less distracting options, such as chapter notes at the back of the book. Too often Elizondo relates a story, mentions a quote or cites an interesting detail that he attributes to an unnamed someone or somewhere else, and about which it would have added to the book's credibility to be able to seek out the context or to read more; yet there was often no clue where to find that "more." Many of the references I was already familiar with, and could put my finger on. But there were some that were not, and the same would apply more broadly for many who might read the book. This is a problem that in the future should be corrected, if *Imminent*'s full value is to be realized.

One way to describe the book would be as a series of vignettes, some short, some longer, united by a common

thread—Elizondo's personal story that anchors the pieces together. But there is a bit of skipping back and forth and around. If managed properly, this is not problematic. But I didn't always feel that the chronology was preserved. It was occasionally hard to tell whether something described in one section or chapter occurred before or after what was happening in the next.

There were several interesting reveals here, most of which will be familiar to those who are well-steeped in the UAP lore. But the majority of readers will likely be unaware. One example that will surprise many unfamiliar with the literature is the extent to which harm has occurred to humans from close encounters with UAPs. For example, the Colares, Brazil, incidents yielded many documented injuries to locals.

In some passages, Elizondo seems to imply such harm is knowingly inflicted; yet elsewhere leaves the question open as to whether it is merely an unintended consequence of coming into too close contact with inherently dangerous forces and attributes of a UAP. (This is, by the way, an ambiguity I also encountered in Lacatski, Kelleher, and Knapp's (2023) book *Skinwalker at the Pentagon*, as well as some other sources.) It's not unreasonable to expect some confusion when discussing such topics with respect to this esoteric subject matter. After all, we don't actually know whether harm is intended. If we focus strictly on facts and not speculation, all we can say is that *significant harm can and does result* from close encounters of the wrong kind.

There is, nonetheless, much that is interesting, useful, and revelatory in this book. I found enlightening Elizondo's concept of six "observables". These form a set of criteria describing characteristics that single out UAPs as anomalous and differentiate them from mundane phenomena typically mistaken for UAPs. This struck a chord for me, in ways similar to Vallée and Davis's (2005) "6-layer Model for Anomalous Phenomena." (Though the coverage is different, the two sets of six fit well together.)

I also resonated to the answer he gave to a question he was occasionally asked by upper-level decision-makers as to "why [Lue and his associates] had gone to such lengths to push this [UAP] subject into the light of day? Don't we have other problems to focus on?" Elizondo's response:

> ...long running secrets end up disastrous to all nations. Secrets are like perishable food left untouched for too long. Eventually they rot and stink, forcing you to clean out the entire refrigerator. One keeps secrets in the first place to ensure that the enemy doesn't learn something we want to protect. But once a secret becomes widely known, you lose credibility the longer you cling to it. Secrets kept too long impede scientific progress. In this case, it affects everyone on the planet, and so it's better that all of humanity should know the truth. (227)

As a long-time former intelligence officer and classified document custodian, I am cognizant of legitimate reasons to keep secrets beyond their perceived shelf-life. I'm further prepared to believe that many of the *details* about UAPs, technical or otherwise, may justifiably still be kept secret. But that doesn't weaken the force of Elizondo's response. And in this particular case, the Government's history of denial, skepticism, and cynical obfuscation is the major contributor to the kind of doubt and suspicion that exists today over the UAP issue.

I'm no conspiracy theorist, for whom the Government is nothing more than a hive mind, indiscriminately trampling rights and individuals as it works to achieve its nefarious goals. Elizondo's book shows that view to be mistaken. In *Imminent*, there are good guys, bad guys, and in-between guys at every level. But since *we don't often know* which factions in the Government are the obfuscators, I am forced to use "government" as a broad brush, hopefully painting the guilty while not tarnishing too many of the innocent in the Government's employ. Fortunately, Elizondo has pointed his finger at some of the perpetrators. There clearly are more yet that deserve their own form of "disclosure."

If you have any interest at all in the UAP phenomenon, you will definitely find *Imminent* well worth your time.

REFERENCES

Lacatski, J. T., Kelleher, C. A., & Knapp, G. (2023). Skinwalkers at the Pentagon: An insider's account of the secret government UFO program. Spoken Realms; Blackstone Publishing.

Vallée, J. F., & Davis, E. W. (2005). Incommensurability, orthodoxy, and the physics of high strangeness: A 6-layer model for anomalous phenomena. In J. Fernandes & N. L. Santos (Eds.), Proceedings of the 2003 International Forum on Science, Religion and Consciousness (pp. 225–239). Cons-Ciências CTEC Press.

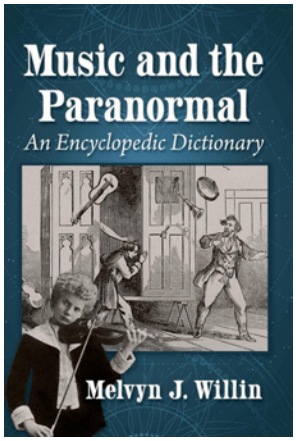
Journal of Scientific Exploration
Anomalistics and Frontier Science

BOOK AND MULTIMEDIA REVIEW

Melvyn J. Willin, Music and the Paranormal: An Encyclopedic Dictionary, Jefferson, NC: McFarland & Company, 2022

Greg Sandow

greg@gregsandow.com



Melvyn J. Willin, Music and the Paranormal: An Encyclopedic Dictionary

ISBN 978-1-032-91097-0

https://doi.org/10.31275/20253785

Melvyn J. Willin has two doctorates in paramusicology, a field he seems to have created, in which music and the paranormal mix. So he'd seem to be the perfect author for this book, which (as its subtitle says) is a dictionary and encyclopedia, an alphabetical listing and discussion of people, places, and phenomena in which music and the paranormal might seem to mix.

And, to judge from a bio on his website, Willin is a lively soul — a guitarist, a witch, an archivist of unpublished poltergeist events, and also a Morris dancer and a practitioner of martial arts.

The book did bring me one delight, which I'll save for the end of the review. Note, though, that what delighted me is something Willin mentions, without (or so it seems) understanding how important it is. And because of this and other lapses, the book is disappointing.

Almost right from the start, there are problems. The second entry is for Arthur M. Abell, an American writer active in the late 19th and early 20th centuries, and best known for a book of interviews with great classical composers, whom he quotes as saying that their music was inspired by God or by other forces larger than themselves.

But these interviews, published 50 years after Abell says they were done, aren't thought to be genuine. Even Willin's quotes from them are suspect. Brahms is quoted gushing about his inspiration from above, while everywhere else he's been described (both in his time and ours) as reticent about himself and skeptical about religion. The leading English-language Brahms biography doesn't mention Abell or include his quotes.

Willin also gives us nonsense about Debussy — that the great French composer may have been a "Grand Master" of a "mysterious esoteric society," the Priory of Sion. But the Priory never existed; the book that first described it, and mentioned Debussy, is known to be a hoax.

Here are some further errors about musical things. They might seem esoteric in an age when not so many people know classical music. But to assess Willin's work, I need to note them, since classical music (to judge from the book) is his musical home turf.

- The American composer Gian-Carlo Menotti gets an entry, because — this is all the entry says — he wrote an opera about a fraudulent medium. But he's far more famous for another opera, *Amahl and the Night Visitors,* with a far more paranormal theme — it's about a boy whose disabled leg is miraculously cured. Plus, Menotti himself, as a child, reportedly had his own miraculous cure of his own disabled leg. (Or so says the one published Menotti biography, which gives no source for the story.)

- Willin misspells the name of a 19th-century French singer, Célestine Galli-Marié (in the book for a plausibly paranormal event I'll mention later), leaving out the second accent. A small thing, maybe, but, in identifying her, he leaves out what she's most famous for — creating the title role in *Carmen,* one of the most popular operas — and instead has her singing a world premiere she couldn't have been in, of an opera written 100 years before she was born.
- He somehow thinks that Schoenberg's String Trio is about a near-death experience, the possibly paranormal kind, with a welcoming white light. This may be unfamiliar territory even for classical music fans, since Schoenberg, an intense 20th-century modernist, isn't a composer many people listen to. But the history of the String Trio is well known; as Schoenberg told his friends, it depicts — in music full of painful jabs and whispers — his pain from a nearly fatal heart attack, which you could call a near-death experience, but not the paranormal kind.

To be fair, Willin seems to know a lot about 19th and early 20th century spiritualism, which is in the book because of seances where music with no source reportedly was heard, or where, reportedly, musical instruments seemed to play themselves. But he doesn't parse these accounts with clarity enough for us to judge if these events might, incredibly, have happened. Or, setting a lower bar, even to guide us in thinking about them. I'd guess it's impossible to draw conclusions after so many years, but the book doesn't help me with thog. Though Willin does draw conclusions in his longest entry, for the once-famous British medium Rosemary Brown, who said that great composers spoke to her, and, from beyond the grave, dictated new piano works. In 1970, she released an album with these pieces, called *A Musical Seance* (which I bought back then, and which you can still find on streaming services). Of course, the question would be whether Liszt, Schubert, and the other greats Brown named really wrote that music. Willin, to his credit, applies the simplest test. How does the music sound? It doesn't seem like great composers' work, he says, joining many others, including me. It doesn't nearly have their spark or depth.

But he gets lost in his entries — more than 150 of them — on places where music has reportedly been heard, with no apparent source. This, clearly, is a phenomenon, or rather, the reports are. But listing them by their geographical locations — mostly old British homes and churches — is unhelpful, to put it mildly. He needs to put the reports (or at least the most important ones) together and then assess them. This is exactly what he does in a doctoral dissertation (online at https://etheses.whiterose.ac.uk/id/eprint/14778/), where he concludes (to quote his abstract) that "seemingly genuine anomalies are generally found to consist of mistaken identities or the embroidery of anecdotal facts. It would appear [he adds] that human susceptibility and enthusiasm for the paranormal are responsible for most of the data discovered." It's beyond me why he doesn't say this in his book, or even leave himself a place to say it.

(Also — perhaps because he's British, and focused on British happenings — he misses American reports where ghostly rock songs supposedly are heard, along with noises of a crash at the site where Buddy Holly's plane so famously went down.)

Is anything reported in this book plausibly paranormal?

Is there anything reported in this book that might be truly paranormal? I'll skip past entries like those for "Chant" and "Religion," in which Willin somewhat vaguely passes on, from other writers, intimations that music might inherently have paranormal force. Of course (and Willin understands this), music needs no paranormal edge to have power in chants and other religious rituals.

Which then leaves me with more prosaic entries, in which, less globally, we learn of paranormal things that may have happened to musicians. Two of these stand out, both with stories amply documented elsewhere (an important confirmation, since, as I've shown, Willin can be credulous).

One is the entry for Célestine Galli-Marié, who not only created the role of Carmen but also became identified with it. In the opera, there's a moment when Carmen foretells her own death, and one night, coming to that place, Galli-Marié felt a great foreboding, and afterward collapsed offstage. She later learned that Georges Bizet, who wrote the opera, had died that day. They had a close artistic and personal connection (unmentioned in Willin's book); she may, in fact, have been having an affair with him. Of course, this is a familiar paranormal trope, in which a person senses the death of someone close to them. If we believe such things can happen (we all can decide whether we do), why not with Galli-Marié?

The other plausible account is about the violinist Jelly d'Aranyi, and Schumann's violin concerto, his last major work, which was hidden by associates after his 1856 death.

Schumann was mentally ill when he died, and musicians close to him felt that the concerto was incompetently written. In 1933, d'Aranyi, using a precursor of an Ouija board, spoke, she said, to Schumann's spirit, which told her that the concerto existed, along with where it might be found. And it *was* found there, was performed, and became at least an occasional part of the concert repertoire. Some nonparanormal information may have helped in finding it, since its existence wasn't wholly secret, but there's no doubt, in what I've seen of the Schumann literature, that the search was sparked by d'Aranyi. (Who, of course, might just have had a paranormal instinct, which felt, to her, like Schumann).

And now the great delight that Willin — unwittingly — brought me. He has an entry on Chopin, in which he says the pianist Byron Janis revealed paranormal events "centered on" Chopin's memory. It's puzzling, I have to say, that Willin doesn't mention what these were.

But even more puzzling is his footnote to the source of this, which is Janis's memoir (coauthored with his wife), whose title, Willin says, is *Chopin and Beyond*. But that's incorrect. The true title is *Chopin and Beyond: My Extraordinary Life with Music and the Paranormal*. An astounding lapse for Willin, of all people, to have. And in this book, of all books.

I was curious to read the memoir, and loved it, first on musical grounds — Janis (a virtuoso who in the 1950s and 1960s was a leading classical music celebrity) has striking stories to tell, about playing throughout his career with an injured hand, about performing in the Soviet Union when other Americans didn't, about his studies with the most virtuosic of all 20th century pianists, Vladimir Horowitz (who took no other pupils). Janis lived no ordinary life, even for a top musician.

And that's doubly true of the paranormal part of the book, which Janis was brave to write. He was a public figure, famous beyond classical music, at home in American and European high society, friends with Picasso and many other notables. And still he devoted half his memoir to things most people with his fame might never reveal — events that, if they really happened, are beyond doubt paranormal, and were so frequent that they became routine for him, observed over and over by his family, he says, and by his friends. These, he says, included poltergeist phenomena, things in his apartment moving, day after day, with no apparent cause. A death mask of Chopin shed tears.

And then there's this, reported beyond the memoir book, in news stories in, among other places, the *New York Times*. Janis visited a friend, a French aristocrat, who showed him unopened boxes full of historical materials. Acting on an impulse, Janis opened one of them and found two manuscripts of Chopin pieces, written in Chopin's own hand. The pieces were known, but the manuscripts — with intriguing differences from the published versions — had never surfaced.

Six years later, at the music library at Yale, Janis, again on an impulse, looked in a box no one had opened, and again found Chopin manuscripts — of the same two pieces. Which, to put it mildly, is arresting. Chopin scholars authenticated the manuscripts, and it's plausible that more than one existed for each piece, because composers of Chopin's time might create new manuscripts even of their published compositions, as gifts to friends or patrons.

To fully document all this, someone would have had to contact both the French aristocrat and the person at Yale who took Janis to the room in the library with the unopened box. I don't know that this was done. But (apart from disbelieving anything that could be paranormal) I don't see a clear reason to doubt Janis's account, which is supported, at the very least, by the existence of the manuscripts. Finding them even in a normal way wouldn't have been routine. Do we imagine Janis did that, without anyone knowing he did, and then made up what he tells us in his book (and told the *New York Times*), without anyone contradicting him?

Seems unlikely. What Janis tells remains arresting. As is everything in his book that touches on the paranormal, all of it all the more arresting for the unaffected way that Janis writes about it, as if he felt no need to impress or convince anyone. This is an important contribution to the paranormal literature, and I'm delighted Willin led me to it, even if his own book is disappointing.

Journal of Scientific Exploration
Anomalistics and Frontier Science

CORRESPONDENCE

Revisiting Chronic Illness through the Lens of Social Miasm Theory: A Reflection on Stephinity Salazar's Approach

Michael Teut
Priv.-Doz. Dr. med. Michael Teut
Courbièrestr 5, 10787 Berlin, Germany
praxis@michael-teut.de

https://doi.org/10.31275/20253797

In her thought-provoking article, *Social Miasm Theory: Revisiting Chronic Illness from the Meta-Perspective of Suppression*, Stephinity Salazar presents a bold critique of modern society, urging a shift towards a more harmonious relationship with nature and one another. Her work invites readers to explore health through a holistic, multidimensional lens, incorporating metaphors, alternative healing perspectives, and critiques of contemporary institutions. At the heart of Salazar's argument is the introduction of 'Social Miasm Theory,' a concept that seeks to link social, psychological, and environmental factors with chronic illness, drawing on principles from homeopathy and Samuel Hahnemann's ideas about miasms.

Hahnemann, a pioneering figure in homeopathy, categorized miasms into three distinct types: psoric, sycotic, and syphilitic. These miasms were seen as underlying causes of chronic illness, with each stage representing a different level of disease progression. According to Salazar, when earlier, more acute symptoms such as skin rashes are suppressed, they give way to deeper and more complex health issues, such as cancer, mental illness, and autoimmune disorders. In essence, Salazar's extension of Hahnemann's theory suggests that chronic illnesses arise when toxins, traumas, and suppressed emotions are not addressed, ultimately leading to more severe health problems down the line.

Salazar's critique of modern society is rooted in the belief that widespread suppression—whether through pharmaceutical treatments or media censorship—contributes to the rise of chronic illnesses. She argues that contemporary systems of control, such as corporate and governmental power, foster an environment where individuals are unable to fully express or heal from their emotional and physical suffering. While her critique of these institutions is valid in many ways, the article sometimes presents a rather simplistic binary: "the powerful" are depicted as oppressive forces, while "the people" are framed as innocent victims. This perspective could benefit from more nuance and empirical evidence to strengthen its overall credibility.

A central theme in Salazar's article is the idea that health is not solely an individual concern but is deeply intertwined with the health of the environment and society as a whole. This viewpoint aligns with the growing recognition in integrative medicine that personal well-being is interdependent with ecological health and societal structures. However, the article's argument that the immune system, soil, and oceans are all interconnected in a single "toxic" ecosystem could be expanded with more concrete, empirical examples. While the theory is compelling, the lack of data supporting these connections may leave some readers questioning the practicality of the argument.

Overall, Salazar's Social Miasm Theory presents a fascinating, albeit controversial, way to view the societal and environmental crises that many of us face today. The theory calls for a systemic overhaul based on holistic principles, encouraging us to rethink how health, society, and the environment are interconnected. However, for the article to have a more lasting impact, it would benefit from stronger evidence and clearer practical frameworks that could guide such a transformation. Additionally, a more balanced critique of societal institutions, a less combative tone, and clearer pathways toward actionable change would enhance the effectiveness of Salazar's message. Despite its provocative nature, the article raises important questions about the state of our world, making it a valuable contribution to the ongoing conversation about health, society, and the environment.

Journal of Scientific Exploration
Anomalistics and Frontier Science

Response to Dr. Teut

CORRESPONDENCE

Stephinity Salazar
instephinity@gmail.com

https://doi.org/10.31275/20253821

Thanks to Dr. Teut for his letter response to Social Miasm Theory— I appreciate his read and brief overview of my paper, wherein I address the three aspects of pathogenesis as stemming from suppression of truth, trauma, and toxemia, and I mention that truth is superscedent.

Per his critique that I simplify some subjects as binary, I concisely brief upon the mechanisms behind *why* there may be purposeful suppression of various aspects of history and our current sciences, focusing on the corporate greed behind medical and agricultural institutions. My original body of work was three times in length with more evidence to support this extended hypothesis, especially that of truth suppression. Additionally, it was not my intention to frame "the people" as victims; it is my personal belief that everyone should hold themselves empowered and responsible for their actions, as society is a collective of individuals.

I agree it is a favorable approach to offer solutions: Some of what I consider suppressed technologies, such as CoP>1 systems technologies and various holistic approaches to healing, can offer solutions to social miasma, but these solutions will have to wait for the book, where there will be a much greater opportunity to express in detail.

JSE AUTHOR GUIDELINES - UPDATED MARCH 2023

Submit to: *journalofscientificexploration.org*

JSE publishes Regular Articles, Literature Reviews, Student and Citizen Science papers, Brief Reports, Book and Multimedia Reviews, Essays, and Letters. Invited content in these categories is also published periodically. Please ensure that your submission meets APA Guidelines (7th edition) and conforms to the parameters below.

There are no strict word limits, but guidelines for different types of submissions are given below. In all cases, authors should be as clear, direct, and concise as possible in their presentations. The Editor-in-Chief reserves the right to mandate revisions to the lengths of accepted papers in the interest of readability, accessibility, and space.

Contributions can be empirical research, critical or integrative reviews of the literature, position papers, policy perspectives, or comments and criticisms. Studies can adopt diverse methods, including qualitative, ethnographic, historical, survey, philosophical, case study, quantitative, experimental, quasi-experimental, data mining, and data analytics approaches.

A. REGULAR ARTICLES (11K WORDS MAX)

Primary research or interesting and important theoretical papers that foster the diversity and debate inherent to the scientific process. This entails novel or innovative ideas that have some 'fragmentary' experimental or empirical support but which can be evaluated with logic and open-mindedness to present academia with provocative hypotheses that would otherwise be rejected by most conventional journals. Additional requirements are as follows:

1. All empirical results that have not been replicated should be called 'preliminary' with the findings treated as such. Peer-review and publication priority will be given to studies that are (a) pre-registered or (b) replications. Note that 'replication' can involve repeating the research procedure in a (nearly) identical separate study to be reported within the same paper (e.g., 'Study 2: Replication'). Or, large datasets can be divided randomly into 'Training' and 'Test (or Validation)' sets, i.e., the research findings presented are those results that replicated in the Test set.

2. To promote stricter transparency and context for readers, all analyses where appropriate should provide effect size statistics in the form of direct percentages of either *association* (correlative analysis) or *mean percentage differences* (ANOVA, *t*-tests, etc.). In the case of correlative analysis, reported results shall report R^2 to provide a covariance percentage estimate. Mean tests shall provide a 'percentage change' indicating the actual percentage change between groups (e.g., M = 3.44 Group 1 versus M = 4.02, in Group 2, on a five-point scale is calculated by the following: ABS [$M_1 - M_{2/5}$ (scale range)] = 11.6% shift or change in means). Standard effect statistics also are allowed, so long as the above percentage techniques are likewise reported. These statistics should be reported in results as 'percentage effect' and follow immediately after standard statistical analysis notation. For correlation, (r = .43, p < .01, percentage effect = 18%), for means tests (M_1 = 3.44 versus M_2 = 4.02, t = 3.443, p < .01, percentage effect = 11.6%).

B. SYSTEMATIC, NARRATIVE, AND SCOPING REVIEWS (12 K WORDS MAX)

All meta-analyses and systematic reviews should include a PRISMA flow diagram to clarify for readers how the exclusion/inclusion criteria were applied to create the literature set under consideration: See http://www.prisma-statement.org/

C. BRIEF REPORTS AND RAPID PUBLICATIONS (2K WORDS MAX)

These are usually pilot studies, direct or conceptual replication attempts of previous work, case studies, brief evaluations, reviews, or 'citizen scientist' efforts that are unique, first-time reports, with no more than two tables and/or figures and 10 references. This rapid publication option is especially appropriate for graduate-level student studies, pilot or preliminary research, or descriptions of important new methods or instrumentation. These reports are subject to blinded peer review in the same manner as research articles. Authors should follow all requirements for longer manuscripts when submitting Brief Reports, including that they have not been submitted or published elsewhere.

D. BOOK AND MULTIMEDIA REVIEWS (2K WORDS MAX)

Structured for readability and utility in which the content is suitably contextualized and includes links to general model-building or theory-formation in the respective domain(s). Please use the following headers, or otherwise incorporate these themes into the review: (a) Author Disclosures; (b) Content Overview; (c) Pros, Cons, and the Book's Contributions to the Literature; (d) Recommendation; and (e) References (if applicable). For an example, see: https://www.spr.ac.uk/book-review/poltergeist-night-side-physics-keith-linder

Multimedia reviews can cover films, documentaries, recorded presentations or symposia, video series and reports, websites that are comprehensive resources, software for scholars, and even peer-reviewed articles in other journals that are pertinent to frontier science. Submissions are now being accepted, and authors should note that these multimedia reviews should include four components: (a) Introduction; (b) Summary of the Media Content; (c) Description of the Value of the Media to the *Journal*'s Readership; and (d) Critique of the Media. These components need not constitute major sections, but each issue should be clearly addressed in the submission. We strongly encourage prospective authors to discuss their topic for a multimedia review with the Editor prior to submission.

E. ESSAYS (8K WORDS MAX)

Important conceptual or philosophical commentaries, observations, or arguments to spark constructive discussion or debate relative to theory, methodology, or practice.

F. LETTERS TO THE EDITOR (1K WORDS MAX)

Must address substantive issues relative to recently published content in the Journal.

SUBMISSIONS (A) TO (C) AND (E) AS APPROPRIATE, MUST ALSO INCLUDE THE FOLLOWING SECTIONS:

1. **Highlights (i.e., lay summary) (50 words max)**. Placed at the beginning of the article before the scientific abstract, this is a short—1 to 3 sentences—bottom-line description of the paper. Avoid technical terms and prepare the comments akin to a published quote to a non-specialist or uninformed journalist or student about the researchers' interpretation of the main results.

2. **Implications and Applications (~150 words max).** Placed immediately after the Discussion section to succinctly summarize or suggest how the study's methods or findings can potentially inform the study of other issues, anomalies, or fields of study, including interdisciplinary and multidisciplinary approaches.

3. **Author Contributions (Contributor Roles Taxonomy)**. Please include this information within or following the Acknowledgments section. Follow standard guidelines such as this one from Elsevier: https://www.elsevier.com/authors/policies-and-guidelines/credit-author-statement. Also, please include ORCID numbers for authors where possible (on the online submission page).

4. **Data-sharing requirements.** Primary (raw) data (redacted for confidential or personally identifying information) must either be (a) uploaded to a freely accessible repository for independent verification or analysis by qualified researchers and the URLs shared in the paper and in a section called Data Availability under the Acknowledgments section (the *Journal* can provide such space), or (b) otherwise provided to qualified researchers on formal request.