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EDITED BY
Rukhsana Ahmed,
University at Albany, United States

REVIEWED BY
Natasha A. Rascon,
Indiana State University, United States
Kimberly Field-Springer,
Berry College, United States

*CORRESPONDENCE
John Parrish-Sprowl
✉ johparri@iupui.edu

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A case for a quantum informed approach to health communication research

John Parrish-Sprowl* and Susan Parrish-Sprowl

Indiana University, Purdue University Indianapolis, Indianapolis, IN, United States

Foundational social science has dominated health communication research, especially in the mainstream of Western scholarship. Alternative ways of conceptualizing, including most if not all indigenous ways of thinking, have often been relegated to second class status, if regarded at all. For those who questioned prevailing wisdom in the past, the choice regarding theory and research seemed to be one of going in a more interpretive or critical direction and leaving "science" behind or staying within a framework they found wanting in many ways. Ironically, the work of such Communication scholars as Pearce, Dutta, and others, often born from interpretative and critical perspectives, is much more consonant with quantum framed science than social science as practiced. Indeed, much of the body of indigenous perspectives align with quantum theory informed science better than social science as practiced. As we move through the 21st century, it is time that communication theory and research, especially in health communication, moves to reclaim science in ways that shift us from a Newtonian understanding of the world to more a quantum paradigm. As we do so, we will likely find that many who have been on the margins can and should move their work to the mainstream, albeit with a process that synthesizes their work with quantum science. This would help us move forward in ways that not only invite more inclusion, but also create more meaningful ways of conceptualizing communication and its relationship to health.

KEYWORDS

quantum, complexity, paradigm, bioactive, One Health

Introduction

Health communication researchers and practitioners have played an important role in gains made in health over the past few decades. For example, health campaigns helped increase the use of passenger restraints in automobiles, as well as reduce the number of people who smoke tobacco in many countries. In addition, health communication researchers have contributed to a body of knowledge regarding provider interactions with patients that has led to interpersonal communication training in many medical schools. Those who engaged in research and practice in health communication can rightly say that their collective efforts have had a positive impact on both population and individual health. As the future unfolds, there are exciting new efforts in health communication on the horizon. For example, in his keynote address to the DC Health Communication Conference in April of 2023, Edward Maibach, Director of the Center for Climate Change Communication, highlighted the growing importance of climate change issues across the globe and emphasized the critical role of health communication scholars in addressing this pressing issue.

It can be argued that the growth of health communication research in new areas, including climate change and other emergent health foci such as mental health, is a logical progression and creates new domains where contributions to better health can be made. While that is true, it is imperative that we attend to other important data that must also inform our path forward. As we progress toward the middle of the 21st century, there is reason to believe that what has worked in the past may not be up to the challenges of the future. For example, among the many failures cited by the review commission regarding the response to the West Africa Ebola outbreak in 2014–15 are those related to health communication (Wenham, 2017). It is widely known that although global, national, and local health leaders had long anticipated a possible pandemic, governments were not prepared for the communication challenges that arose with COVID-19 as it spread rapidly around the globe. This suggests the need to step back and interrogate our current practice, research and theory to better meet the demands of the future. This timely imperative becomes clear in the ensuing discussion.

Some current global challenges

Despite growing numbers of studies and expanding domains of research and practice, along with greater amounts of money invested in health communication, multiple health challenges that communication could help mitigate continue to grow. Global rates of obesity (World Health Organization, 2021), depression (Marwaha et al., 2023) and stroke (SciTechDaily, 2023) are all on the rise with no end in sight. In addition, vaccine hesitancy and refusal have been increasing for many years and their growth accelerated during the Covid-19 pandemic (Cuffari, 2023). Exacerbating these problems is the burgeoning amount of dis- and mis- information that is so pervasively available that the Director General of WHO has termed it an infodemic (World Health Organization, 2020). Within medical care itself, morbidity and mortality arising from medical error due to communication issues continues to plague hospitals, despite a growing amount of research and programmatic efforts (The Joint Commission, 2015; The HIPPA Journal, 2023). It is reasonable to argue that current health communication practices are not effectively enabling us to manage many health issues. Since research and theory are the keys to developing the best evidence-based practices, it is critical that scholars assess their ability to lead us into the future. Health communication, like all areas of social science currently, is facing headwinds in both areas.

Changing the research paradigm

Emerging problems with research in the social sciences, including health communication, abound. In many cases, there are diverse multiple measures of phenomenon that often become "equivalent" in discussions/literature reviews of the "variable" in question. For example, there are over 280 different measures for depression alone and at least 4500 measures for various dimensions of mental health (Farber et al., 2023). Needless to say, it is difficult to develop a solid body of research when the concepts and their measures are not consistent from study to study. Perhaps this is one of the reasons researchers have a replicability problem in psychology and other social sciences (Carey, 2015; Bartlett, 2018; Hensel, 2021). If scholars cannot replicate findings, then it is difficult to draw strong conclusions from the studies.

Additional contributing problems include p-hacking which is done to boost publication but not necessarily to advance knowledge and understanding. In all, the amount of research is growing, but at the same time the quality of much of it is suspect. Rather than castigate individual researchers, it is worth considering that scholarship may have reached the boundaries of what the prevailing paradigm can enable, much as what happened in physics a little over a century ago and, we argue, is instructive for the social sciences today. As Kumar noted:

> The story of quantum begins at the end of the 19th century when, despite the recent discoveries of the electron, X-rays, and radioactivity, and the ongoing dispute about whether or not atoms existed, many physicists were confident that nothing major was left to uncover. "The more important fundamental laws and facts of the physical science have all been discovered, and these are now so firmly established that the possibility of their ever being supplanted in consequence of new discoveries is exceedingly remote," said American physicist Albert Michelson in 1899. "Our future discoveries," he argued, "must be looked for in the sixth place of decimals" (Kumar, 2008, p. xiii).

A decade later, quantum theory and mechanics began emerging and within three decades it was clear that Michelson had been spectacularly wrong.

The foundational paradigm that framed all research and theory in physics until the quantum shift also frames the assumptions found in the social sciences. As Zohar (2021) notes in her recent book:

> Newton's three Laws of Motion (plus his Law of Gravitation) described a universe that is simple, law-abiding, predictable, and controllable. His metaphor for the universe was a well-oiled "machine." This model gave birth to the modern mind. It had such a powerful impact that Newton's physics became the template for all subsequent thinkers, in every field of thought for the next 300 years… (https://link.springer.com/chapter/10.1007/978-981-16-7849-3_2).

Newton was a formidable thinker, and he did a masterful job of both aggregating much of the thinking up to his time and adding key thoughts of his own. In doing so, his name adorns the paradigm that shaped thinking across all sciences, including the social sciences. Although sciences have moved beyond this paradigm over the past century, social science has clung to the Newtonian mechanistic, linear, and reductionist assumptions in both theory development and the research that arises from it (Barad, 2007; Wendt, 2015; Parrish-Sprowl et al., 2020).

The case of the social sciences

This is evident in one of the most used theories in health communication, the Theory of Planned Behavior (TPB), which is a modification of the Theory of Reasoned Action. TPB is indexical of many of the theories engaged in health research. It assumes rational, linear action despite plenty of lived experience evidence that this is not always how things work (Chen and Chen, 2019). Perhaps this is why after hundreds of studies, TPB rarely accounts for more than 20% of the variance (Sniehotta et al., 2014). Due to the poor track record of such research, many researchers are calling for its retirement (Sniehotta et al., 2014; Chen and Chen, 2019). However, rather than focus on the theory itself, it might be more fruitful to focus on the paradigmatic assumptions that frame such thinking. Maybe, much like physics in the 1890s, TPB consistently performs as it does because it is the best that can be done given the assumptions of the foundationalist paradigm from which it emerges. Creating a new theory from the same paradigm will ultimately run into the same limitations.

Widespread recognition of the problems associated with mechanistic, reductionistic, and linear assumptions has led to increasing calls for complexity theories that are not bound by such thinking (Greenhalgh and Papoutsi, 2018; Churruca et al., 2019; McGilchrist, 2021). This has given rise to complexity science, complex adaptive systems, and other variations (Churruca et al., 2019). However, some of those using this terminology still do so without the accompanying paradigm change necessary to producing new insights (Long et al., 2018). New language with the old assumptions will likely end up with the same limitations. It is fair to say that a large and growing number of calls for complexity-based research in health recognize, at least implicitly if not explicitly, the limitations of Newtonian paradigm research. That said, there is also a growing chorus of researchers in the social sciences that are explicitly calling for the shift from Newtonian to Quantum to form our basic assumptions in theory, research, and by extension, practice (Barad, 2007; Cooper, 2017; Chen and Chen, 2019; Parrish-Sprowl et al., 2020; Zohar, 2021).

The emerging quantum paradigm

Quantum physics arose from insights that attempted to address the unexplainable in Newtonian physics (Kumar, 2008; Nolte, 2020). With the early publications by Planck and Einstein along with others soon after, physicists began to develop an understanding of how everything worked that was different in many respects from the Newtonian conception of a "well-oiled machine." In quantum, we understand that the universe is composed of a dense web of interactions, and it is these *connections* rather than *things* that create reality (Rovelli, 2021). Indeed, each of these "things" themselves are a locus of interactions. The dynamic interdependence of *everything* is a contrasting framework to the mechanistic notion that had dominated for 300 years. In quantum, one must look to change the interactions to change "things."

To gain insight and elaborate the unfolding paradigm, scholars developed quantum *mechanics,* which is built on mathematics that help explain the various quantum *theories* that are the conceptualizations of how the universe functions. Because it is an emerging paradigm, no one fully understands quantum and there is still much to be learned. Nonetheless, it has been the most successful explanation of all things ever created (Kumar, 2008; Rosenblum and Kuttner, 2011). Even with incomplete knowledge of quantum, researchers and practitioners have been able to develop microchips, computers, mobile phones, MRI machines, and much more that could not have been created without the quantum paradigmatic perspective. If health communication researchers begin to function in a quantum paradigm, it may well open the future to the kinds of gains that have occurred when quantum is engaged elsewhere.

Why move health communication research toward the quantum paradigm?

This question can be answered in at least three ways. The quantum paradigm has dominated physics since the early part of the 20th century and has spread to the other sciences as well (e.g., biology, chemistry). It was dismissed by many, especially in the social sciences, because it was thought to only apply to the very micro world. However, a large body of research has led most physicists to conclude as Rovelli does:

> What we need to add … is the awareness, which has grown in the course of a century of successes for the theory, of the fact that all nature is quantum, and that there is nothing special about a physics laboratory containing measuring apparatus. There are not quantum phenomena only in laboratories and non-quantum phenomena elsewhere: all phenomena are quantum phenomena (Rovelli, 2021, p. 137).

Put another way, if everything else in the universe is quantum, why would human communication be the only phenomenon that is not? In multiple experiments, quantum explanations have been supported and Newtonian theories have not (Marshall, 2015; Cooper, 2017). This is not to say that everything based on a Newtonian paradigm is wrong; that is assuredly not the case. It is simply bound by thinking that inherently cannot produce an accurate description of reality. As philosopher/physicist Healey noted:

> One applies classical mechanics by choosing a model and taking it to represent a physical situation. Our world is so huge and complex that any model capable of accurately representing it would be so far beyond human cognitive resources that we could not use it. But only in use does a mathematical model represent anything. So we cannot envisage an accurate description of the world in terms of classical mechanics. All we can do is develop better and better inaccurate models to serve particular descriptive, predictive and explanatory purposes (https://www.3ammagazine.com/3am/how-pragmatism-reconciles-quantum-~mechanics-with-relativity-etc/).

There is compelling evidence inviting health communication researchers to consider a shift to the quantum paradigm that has

demonstrated theoretical, research and practical successes in a broad number of areas.

Perhaps a less intellectually compelling but highly pragmatic reason to shift to quantum assumptions is that slowly, many others in the social sciences as well as professional practice are doing so. Barad (2007), a physicist in women's studies, Wendt (2015) in international relations, Zohar (2021) in Business, Chen and Chen (2019) in social work, and Parrish-Sprowl et al. (2020) in health communication are examples of this shift. Each of these scholars offers a reasonably accessible entre into quantum and social science. Since a full explication of quantum is beyond the scope of this essay, the authors encourage the reader to access these sources.

Evidence of the growing impact of the quantum paradigm is emerging in other ways as well. For example, elementary education is grappling with the best ways to teach quantum to children (Patterson and Deng, 2023). Researchers are even developing games to facilitate learning about quantum in high schools (Weingartner and Weingartner, 2023). At Princeton, many students take a quantum chemistry course even though they are not destined to be chemists (Fuller-Wright, 2023).

As the instructor of this course notes:

> "Quantum computing and quantum security are huge, growing areas…I want investment bankers who are thinking about investing $500 million in a quantum computer to know the right questions to ask. I want doctors to be able to follow a sales spiel from a quantum medical device startup company. I want grant administrators to know if a proposal has legs or is something to steer clear of. Just because someone isn't going to be sitting at a desk solving equations every day doesn't mean they don't need to have a deep understanding of this." (https://www.princeton.edu/news/2022/11/23/will-not-be-test-new-approach-~learning-quantum-chemistry).

Because most people rely on technology that was developed due to quantum (e.g., computers, mobile phones, GPS, MRI), everyone should begin to understand the basic assumptions of a quantum paradigm. To do so would change both the research questions researchers might pose and how they might go about doing research.

Quantum, health, and communication

Quantum should be especially appealing to those who study communication. As Rovelli notes: "reality is in connections not things" (2021, p. 75). ALL communication scholars, including those in health, are focused on the nature of connections between people. The process of connection is much greater than simply understanding messages and their impact. Research over the past few decades has demonstrated that the connection (sometimes referred to as social, relational, along with other terms) is ALWAYS about communication. Over the past several decades, numerous communication scholars have posited that scholars should focus on the *process of connection* and not just the message content (see, for example, Ruesch and Bateson, 1951; Watzlawick et al., 1967; Berlo, 1977; Pearce, 1989, 2007). It could be argued that their collective ideas, while considered important, did not become the primary basis for health communication research because in many ways they are at odds with the Newtonian paradigm.

This is not to say that each of these scholars embraced quantum theory, only that they made claims about communication that are consonant with it. For example, when Pearce poses the question regarding conversation, "what are we making here," he is directly suggesting, as does quantum theory, that the process of connection creates reality (2007). Pearce often suggested that the Coordinated Management of Meaning (CMM) is an interpretive and/or critical theory rather than a science-based theory. While that is arguably the case, it is consistent with the quantum paradigm that reality is created in connections, not things (Rosenblum and Kuttner, 2011; Rovelli, 2021). The quantum paradigm enables a reinterpretation of social constructionism to recognize that it is more consonant with science than was believed by many to be the case when the field only thought of "science" from a Newtonian perspective.

When Ruesch and Bateson (1951) state that "all psychiatry is communication" and Watzlawick et al. (1967) observe that we are who we are in relation to those with whom we communicate, they are consistent with Pearce (1989, 2007, 2009) in that they are recognizing that relationships create us, at least in a social sense. Neuroscience research takes this even further by recognizing that how people relate to each other shapes their biology as well (Hasson et al., 2012; Cozolino, 2020; Siegel, 2020). In quantum theory, everything is systemically related to everything else. As a consequence, we recognize that communication is not just about social constructions, it is also a bioactive process (Parrish-Sprowl, 2017). How we interact with each other impacts such processes as gene expression (Cunliffe, 2016), immune system functioning (Cozolino, 2014), and how we process information (Ramachandran, 2011; Porges, 2017, 2021; Siegel, 2020) in the constant interplay of talk and bodily functioning. This has tremendous implications for health communication research because it places the communication process in a central role in creating individual and community health.

A 21st century health communication research agenda

What does the shift to a quantum paradigm imply for health communication research as we move forward in the 21st century? The quantum paradigm opens up exciting possibilities for research that can facilitate better health and well-being for all. It does not mean that anyone should discontinue the study of message content. Content still matters, but it does so in a different way. By analogy, scientists did not stop exploring gravity with the shift to a quantum paradigm, but they did redefine it and began engaging in research that emerged from the difference in conceptualization. Instead of considering health communication as a category within a discipline that co-exists with other content and context-based categories, we shift to thinking of health as a dimension of the action of communicating. In other words, as people create connections between one other, they are engaged in biological action as well as transferring information and making meaning (Cozolino, 2020; Parrish-Sprowl et al., 2020; Porges, 2021). This leads to a number of provocative questions scholars might consider, such as:

- How can people engage in conversations that create communication ecologies to purposefully influence epigenetic action toward health?
- How do we create communication ecologies that mitigate against depression and anxiety within families and communities?
- How can people interact to strengthen immune system functioning?
- How can we facilitate conversational patterns that positively influence the development/trajectory of chronic diseases such as diabetes?

Health communication research in a quantum paradigm gives rise to questions that lead us to consider more closely *what we are doing to ourselves and others* in the ways we choose to engage with one another.

Communication is bioactive

Given the integral relationship between interaction and biological functioning, we must consider how our biology plays a role in how we process the *message content* of our conversations (Ramachandran, 2011; Cozolino, 2014; McGilchrist, 2021; Porges, 2021). For example, Polyvagal theory articulates the role of the autonomic nervous system and how people process information (Porges, 2017, 2021). Research has established that when people are agitated, angry, or afraid, they process information differently than when they feel safe and calm. The difference can be expressed as being in a reactive vs. receptive state (Parrish-Sprowl et al., 2020, 2023; Wolynn and Hermann, 2021). When dealing with the challenges of mis- or dis- information, it is important to consider nervous system receptivity if we want to facilitate people carefully considering information that challenges their understanding or beliefs. By considering the dynamic interplay of communication and biology, new questions emerge:

- How do people talk with one other to facilitate biological receptivity?
- What skills need to be developed to help us facilitate receptivity in conversation?
- How do we manage the conversation when receptivity is lost?
- What is the relationship between ways of communicating and stress management?
- How can we best interact to promote optimal immune system functioning?

Considering the bioaction of communication offers health communication researchers new trajectories to pursue as we consider how to talk about health issues in various types of relationships.

A recognition of the systemic action of communication, along with its interrelatedness with literally everything else, offers opportunities to pose different questions regarding a range of environment issues, including climate change. "One Health" is an interdisciplinary movement that has unfolded over the past few decades to explore the interplay between plant, human, animal, and environmental health (CDC, 2023). Scientists in these areas recognize the need to work in teams that cross disciplinary boundaries to manage the complex, quantum functioning of nature. Zoonotic diseases, as the COVID-19 pandemic so graphically illustrated, get managed through the interplay between animal and human health, which is a function of communication between species, the environment, animal science, human medical care, public health, and relationships among friends, families, co-workers, service providers, and strangers. Preparing for pandemics means gaining a better understanding of the dynamic connections among all aspects of the process. One Health scientists are increasingly recognizing that even with multiple disciplines working together, they are still bound by the paradigm in which they do their investigations (Mumford et al., 2023). Health communication researchers can work with One Health researchers to consider such questions as:

- How can patterns of interaction enable better zoonotic disease management?
- How do we foster conversations that explicitly and implicitly address ways of being that play a role in climate change?
- What is the relationship between community communication ecologies and the adoption of better planetary stewardship?
- How do scholars weave indigenous ways of knowing into science research to expand our understanding of how all of us might improve planet stewardship?

This is an important contribution that Health Communication researchers can and should make to the One Health Movement's research mission.

Conclusions

The quantum paradigm change is already underway and has been for over a century. Science, especially in physics, is leading the way. It is now beginning to unfold in the social sciences and in various professional practices such as education. To participate, we must reeducate ourselves to move from the Newtonian paradigm to the Quantum paradigm. This requires questioning long held assumptions about how the universe works, the implications for how researchers define and study communication and, subsequently, what types of research questions they might pose as well as how one might investigate these questions. Fortunately, there is a resource pool to help all of us move in this direction. Some of the resources are cited in this essay. Just as the shift to a quantum paradigm yielded new inventions such as microchips which changed our technological capabilities, quantum offers the same prospects for communication.

As the 21st century continues to unfold, health communication research can play an integral role in advancing the lived experience of everyone. It enables differing perspectives on issues of equity and how all of us might grapple with the challenging economics of health care. While there is certainly a learning curve, the potential upside is great and worth the effort. Staying in the same paradigm is likely to generate a lot of activity with little to show for the effort, in comparison with what may be possible with the move to quantum. While the shift might seem daunting, it is also exciting.

Since fear and excitement share similar physiological activation patterns, we argue for leaning into embracing and encouraging the excitement of the challenge to make health communication

research a 21st century success. As Maya Angelo famously said: "I did then what I knew best, when I knew better, I did better." That is our hope for health communication research in the future.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The article was co-written by JP-S and SP-S. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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