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The Explanatory Gap In and Outside Neuroscience:

The Brain Discourse, the Dualist Discourse, and the Epistemological Divide

By

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This paper explores the attitudes toward the mind-body problem and the explanatory gap of consciousness among neuroscientists and the lay public. Specifically, I am interested in the potential tension between the extensive literature on folk dualism and the emerging idea of folk neuropsychology, as well as the explanatory gap between the subjective feeling of consciousness and the un-feel-able brain. I treat the field of neuroscience with its scholars as a cultural group in itself with its own values as well as behavioral patterns.[1] Adopting the idea of cultural symbols proposed by Geertz, I identify the variables that signify the neuroscience community as well as the lay public under the influence of neuroscience.[2]

The mind-body problem of today questions the interaction between the immaterial mind and the physical brain. In the 1950s, cognitive science originated as an interdisciplinary field that hoped to address the problem by looking at how the mechanisms and processes of the human brain produce the mind.[3] Neuroscience, since then, has received copious attention. However, it can be argued that neuroscientists might not understand the mind-body problem.[4] They might be taking for granted the monist view between the brain and the mind and take the temporal relationship between brain activities and tasks performed by the human subjects as causal.[5] In fact, the assumptions behind approaches such as brain-mapping prevailed due to social, political,

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[1] Claude Lévi-Strauss, John Weightman, and Doreen Weightman, *The raw and the cooked* (New York: Harper & Row, 1969).

[2] Clifford Geertz, *The Interpretation of Cultures* (New York: Basic Books, Inc, 1973).

[3] George A.Miller, "The Cognitive Revolution: A Historical Perspective," *Trends in Cognitive Sciences* 7, no. 3 (March 2003): 141-144.

[4] Richard A. Shweder, "The Metaphysical Realities of the Unphysical Sciences: Or Why Vertical Integration Seems Unrealistic to Ontological Pluralists," in *Creating Consilience: Integrating the Sciences and the Humanities*, eds. Edward Slingerland and Mark Collard (New York: Oxford Univeristy Press, 2012), 56-73.

[5] Dumit, Joseph, *Picturing Personhood: Brain Scans and Biomedical Identity* (Princeton, N.J.: Princeton University Press, 2004); Julian Savulescu and Brian D. Earp, "Neuroreductionism About Sex and Love," *Think* 13, no. 38 (September 2014): 7-12.

and historical forces: the ways to look at a brain (such as through brain scans or through dissecting animal brains) determine what is to be found, and what is presented as knowledge about the brain is mediated by culture (for instance, the prevalence of connectionism as an approach to neuroscience coincides with the popularity of the idea of networks).[6] Despite its popularity and perceived promise, neuroscience does not provide sufficient explanations for human consciousness.[7]

Such assumptions in neuroscience lead to the neglect of "the hard problem": the explanatory gap between brain activities and felt conscious experiences.[8] A psychological explanation using the dual-process cognition theory has been proposed for such a gap.[9] The theory posits that cognition consists of two processes: intuition and deliberation. Under this framework, folk dualism favors automatic, intuitive cognitive processing, while neuroscientific theories give explanations that require voluntary reasoning. The explanatory gap appears when the automatic process stays inactivated and does not intuitively confirm our reasoned and analyzed knowledge.[10] Therefore, according to this theory, the theory that the brain is what causes our conscious feelings does not go through the intuitive process: we do not intuitively feel that the theory is true but must rationalize it with effortful cognition.

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[6] Susan Leigh Star, *Regions of The Mind: Brain Research and the Quest for Scientific Certainty* (Stanford, California: Stanford University Press, 1989); Davi Johnson Thornton, *Brain Culture: Neuroscience and Popular Media* (Rutgers University Press, 2011).

[7] Raymond Tallis, "What Neuroscience Cannot Tell Us About Ourselves," *The New Atlantis*, no. 29 (Fall 2010): 3-25.

[8] David Chalmers, "The Puzzle of Conscious Experience," *Scientific American* 273, no. 6 (December 1995): 80-86.

[9] Brian Fialam, Adam Arico, and Shaun Nichols, "On the Psychological Origins of Dualism: Dual-Process Cognition and the Explanatory Gap," in *Creating Consilience: Integrating the Sciences and the Humanities*, eds. Edward Slingerland and Mark Collard (New York: Oxford Univeristy Press, 2012), 88-109.

[10] Ibid.

Yet, neuroscience is represented in the media in a way that reinforces these assumptions, building into the public a view of neuro-realism (neuroscience inaccurately "proving" the realness of beliefs or experiences) and neuro-essentialism (treating the brain as the essence of personhood).[11] Studies have recently started to emerge on "folk neuropsychology", the way people use neuroscientific terms to express psychological experiences ("stuck in my brain", "use your brain", "a cerebral book", etc.).[12] Even though people do not have direct sensory access to the inside of their brains, they talk in daily life as if they did. Empirical studies have dealt with such a discourse in children, in adults with ADHD, through a television program in Argentina, in the field of neuroenhancement, as well as ways to alter the problematic aspects of such discourses.[13] It has been shown that neuroscience has influenced the public to adopt such a discourse that promotes a monist view of mind-brain and emphasizes neuro-essentialism.[14]

Contrary to folk neuropsychology, there is extensive literature on the idea of folk dualism, an argument that people are intuitively dualist in nature. Folk dualism maintains that

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[11] Eric Racine, Ofek Bar-Ilan, and Judy Illes, "FMRI in the Public Eye," *Nature Reviews Neuroscience* 6, no. 2 (March 2005): 159–164; Eric Racine et al., "Contemporary Neuroscience in the Media," *Social Science & Medicine* 71, no. 4 (August 2010): 725-733; Diane M. Beck, "The Appeal of the Brain in the Popular Press," *Perspectives on Psychological Science* 5, no. 6 (November 2010): 762–766; Cliodhna O'Connor, Geraint Rees, and Helene Joffe, "Neuroscience in the Public Sphere," *Neuron* 74, no. 2 (April 2012): 220-226.

[12] Paul Rodriguez, "Talking Brains: A Cognitive Semantic Analysis of an Emerging Folk Neuropsychology," *Public Understanding of Science* 15, no.3 (July 2006): 301-330.

[13] Ilina Singh, "Brain Talk: Power and Negotiation in Children's Discourse about Self, Brain and Behaviour," *Sociology of Health & Illness* 35, no. 6 (October 2012): 813-827; Christian Broer and Marjolijn Heerings, "Neurobiology in Public and Private Discourse: The Case of Adults with ADHD," *Sociology of Health and Illness* 35, no. 1 (January 2013): 49-65; Maria Jimena Mantilla, "Educating 'Cerebral Subjects': The Emergence of Brain Talk in the Argentinean Society," *BioSocieties* 10, no. 1 (September 2014): 84–106; Jonna Brenninkmeijer, "The Brain as an Agentic System: How the Brain is Articulated in the Field of Neuroenhancement," *Sociology of Health & Illness* 41, no. 1 (January 2019): 112–127; Jolien C Francken and Marc Slors, "Neuroscience and Everyday Life: Facing the Translation Problem," *Brain and Cognition* 120 (February 2018): 67-74.

[14]Cliodhna O'Connor and Helene Joffe, "How Has Neuroscience Affected Lay Understandings of Personhood? A Review of The Evidence," *Public Understanding of Science* 22, no. 3 April 2013): 254–268.

people intuitively possess separate concepts of the mind and the body and that the essence of our identity is in the mind, rather than the body. Paul Bloom, a strong advocate of this view, points out the innate and natural dualist beliefs in humans by presenting evidence on human infants and children.[15] In addition, surveys from the University of Edinburgh and the University of Liège show the prevalence of mind-body dualist beliefs among the lay public. They also show that more than one-third of medical professionals consider the mind and the brain as different from each other.[16] Similarly, a large-scale survey study demonstrates a widespread belief in dualism in the US and Singapore.[17] Joubert, moreover, maintained that scientific fields, including medical science, cannot escape mind-body dualism and that the self is more than the brain.[18] Complementing the folk dualism literature, a survey by Richert and Harris demonstrates that adults adopt more than a mind-body dualism: most adults consider both the mind and the soul as separate entities from the body.[19]

Therefore, two seemingly contradictory phenomena co-exist among the lay public. On one hand, folk dualism points to an intuition opposing the monist view as presented by neuroscientific discourse in the media. On the other hand, neuroscience triggers folk

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[15] Paul Bloom, *Descartes' Baby: How the Science of Child Development Explains What Makes Us Human* (Basic Books, 2004).

[16] Athena Demertzi et al., "Dualism Persists in the Science of Mind," *Annals of the New York Academy of Sciences* 1157, no. 1 (April 2009): 1-9.

[17] David Wisniewski, Robert Deutschländer, and John-Dylan Haynes, "Free Will Beliefs are Better Predicted by Dualism Than Determinism Beliefs Across Different Cultures," *PLoS One* 14, no. 9 (September 2019): e0221617, https://doi.org/10.1371/journal.pone.0221617.

[18] Callie Joubert, "Medicine and Mind-Body Dualism: A Reply to Mehta's Critique," *Mens Sana Monographs* 12, no. 1(January - December 2014): 104-126.

[19] Rebekah Richert and Paul L. Harris, "Dualism Revisited: Body vs. Mind vs. Soul," *Journal of Cognition and Culture* 8, no. 1-2 (April 2008): 99-115.

neuropsychology that influences folk's commonsense notions of the mind and the body (and the brain).

There are, in fact, a small number of neuroscientists who maintain a dualist position and defend their dualist beliefs with neuroscientific evidence.[20] For instance, Wilder Penfield, a brain surgeon, points out that the absence of intellectual or abstract thoughts or the sense of agency in any patient's brain triggered by stimulation with electrodes suggests that the brain does not account for these complex aspects of the mind.[21] Similarly, Roger Sperry's surgical and experimental work led him to believe that the mind is more than the sum of both hemispheres of the brain.[22]

The existence of dualist neuroscientists challenges the scientist-laypeople dichotomy in terms of ontological attitudes. What is the state of neuroscientific opinions today? What about the public reception of neuroscience among lay public? How do these factors influence commonsense folk dualism? This paper delves into these questions using qualitative methodologies.

Drawing from qualitative interview data, this paper aims to argue that 1) the explanatory gap of consciousness is salient among both groups, 2) different signifiers exist in the

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[20] Wilder Penfield, *Mystery of the Mind: A Critical Study of Consciousness and the Human Brain* (Princeton University Press, 1978); John C. Eccles 1903-1997 and Daniel N.Robinson, *The Wonder of Being Human: Our Brain and Our Mind* (New York, N.Y.: London: Free Press, 1984); Charles Sherrington, *Man on His Nature* (Cambridge [Eng.]: The University Press, 1940); Roger Sperry, *Science and Moral Priority: Merging Mind, Brain, and Human Values* (New York: Columbia University Press, 1983); Roger Sperry, "New Mindset on Consciousness," *Sunrise Magazine,* December 1987/January 1988; Benjamin Libet, *Mind Time: The Temporal Factor in Consciousness* (Cambridge, Mass.: Harvard University Press, 2004); Michael Egnor, "More Than Material Minds," *Christianity Today*, September 14, 2018, https://www.christianitytoday.com/ct/2018/september-web-only/more-than-material-minds-neuroscience-souls.html; David B. Hershenov and A. P. Taylor, "Split Brains: No Headache for The Soul Theorist," *Religious Studies* 50, no. 4 (April 2014), 487-503.

[21] Penfield, *Mystery of the Mind.*

[22] Sperry, "New Mindset on Consciousness."

neuroscientific field and the lay community, 3) both communities are under the influence of the brain discourse and the dualist discourse, 4) the signifiers, the two discourse, and, briefly, affective factors have a powerful impact on people's ontological attitudes, and 5) the epistemological divide explains the co-existence of the conflicting theories: folk dualism and folk neuropsychology.

Methods

Participants

This study was carried out as an independent thesis project for the M.A. Program in the Social Sciences (MAPSS) at The University of Chicago. I conducted interviews with 11 scholars within the neuroscience field (including doctoral students and faculty) as well as 10 people outside of the field.[23] Scientists inside the neuroscientific fields were contacted and invited to participate in this study via email. Participants outside of the neuroscientific fields were recruited by snowballing via the neuroscience scholar participants as well as via social media postings targeted at undergraduate students of any other academic fields.

This study was approved by the Institutional Review Board (IRB) at The University of Chicago. Due to safety concerns during the COVID-19 pandemic, the entire procedure of the study was conducted remotely.

[23] See Appendix 1.

Procedure

Data Collection

Semi-structured interviews were conducted via Zoom. The interviews were semi-structured since the loose structure allowed for participants' freedom to define and explain their understanding of "the mind". I arranged the questions in a way that did not have a priming effect on participants. Neuroscientists and non-neuroscientists received different questions during the interviews. While neuroscientists were instructed to explain their technical understanding of and beliefs about the mind-body problem, the explanatory gap, and relevant issues related to their research, non-neuroscientist participants were asked to explain their personal understanding of the mind, the brain, the soul, the relevance of these terms to their life and their sense of self. Some examples of the questions asked are listed below. Follow-up questions tailored to each participant were raised for clarification purposes.

Examples of interview questions for neuroscientists:

- What, to you, is the mind-body problem?
- Do you think it is a problem? Has it been solved? Is it solvable?
- Do you think the problem is relevant to your research?
- Do you think we can explain the relationship between our subjective, qualitative experiences and brain activities? Do you think there is a gap in explanation?
- Do you remember moments in your life when you began to see things (everything we've been talking about so far) differently?

Examples of interview questions for non-neuroscientists:

- For you, what would you say is the mind? How would you describe it? What do you associate the term "mind" with?
- Where do you think the mind comes from? Does it change over time?
- What is the role of your brain in how you live your life or your sense of self?
- How much would you say you know about how the brain works/neuroscience?
- How would you explain the relationship between your mind and your brain?

When I detected a connection or conflict between the participants' descriptions of the mind and the brain or brain functions, I would ask follow-up questions for clarifications. When relevant to the conversation, neuroscientists would be asked about their understanding of the role of the rest of the body, the environmental factors, voluntary actions, as well as the idea of free will. Similarly, when relevant to the conversation, non-neuroscientists would be asked about their religious and cultural background and their academic background (in general and in psychology or neuroscience).

Data Analysis & Theoretical Justification

Interviews were recorded and transcribed. They were then coded with the qualitative data analysis computer software MAXQDA and analyzed. Themes were extracted, organized, and compared to the existing literature. The participants' accounts, including those of the neuroscientific scholars, were treated as individual stories that contribute to my understanding of their cultural communities. In this sense, my methods were bottom-up, treating an established scientific field as an unfamiliar cultural group, grounded in the empirical data I gathered from the participants. I found patterns in each of the stories before moving on to the next, looking for

overlapping themes and transformations. I identified variables and themes through qualitative data analysis. I tried my best to resist putting people (neuroscientists or not) into predetermined categories (e.g. according to their academic training, religious beliefs, cultural backgrounds, etc.). Rather, I derived the connections between these potential factors and people's attitudes and values from their narratives. As a qualitative study, it was not the aim of this paper to generalize its results to the Western culture at large. Instead, it was to make connections that provide insights into the structures of these groups. Therefore, this study delved into the specific problems of the explanatory gap of consciousness from two perspectives: that of the neuroscientific community (via interviews with neuroscientists) and that of the lay public under the influence of neuroscience (via interviews with the non-scientists).

The results of the qualitative interviews were compared to existing survey data as well in order to gain insights into the nuances of the major theory, i.e. folk dualism. Quantitative and large-scale surveys convey representative data and provide a large-scale picture of the population, but they lack details and nuances, and they do not usually allow for thoughtful reflection and explanations by the participants. The in-depth, qualitative interviews of this study complement the existing surveys by providing rich nuances and connections across people's values, beliefs, and commonsense knowledge.

Study Findings

It should be made clear that the conceptualization of a crude classification of the two domains, namely the dichotomy between the scientific community and the lay public, is one that was shown to be too simplified and naive here. In fact, parallels were observed between the

people inside and outside of neuroscience in terms of their dualist discourse and personal beliefs. These parallels not only provide evidence supporting a potential underlying psychological tendency that is the explanatory gap of consciousness and suggests the possibility of a general intuition about the mind-body relationship but, more crucially, showcase the influence of two discourses that are actively in play for both groups: what I call "the dualist discourse" and "the brain discourse". As Clark points out, different cultural elements can co-exist and manifest even in the space of one community.[24] This multifactorial influence of dynamics and mechanisms from two coexisting cultural discourses in single communities is indeed what I derived from the data and what I hope to convey in this paper.[25]

Three important parallels were found between the neuroscientist group and the lay group. First, the explanatory gap was found to be visible among both groups. Second, the gap was found to be managed in similar ways among both groups, and the most salient approach is what I call "the epistemological divide". Third, both groups were found to be under the influence of the two above-mentioned discourses. Among the parallels, the second one forcefully explains the tension between folk dualism and folk neuropsychology.

The parallels, however, are not always self-evident. Adopting the idea of cultural symbols proposed by Geertz, I argue that this invisibility is due to the vastly different symbolizing conventions at play for the neuroscientific community and the lay community.[26] These conventions manifest in people's discourses, shared values, and practices. Below I demonstrate

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[24] Daniel Aaron Silver and Terry Nichols Clark, *Scenescapes: How qualities of place shape social life* (The University of Chicago Press, 2017).

[25] Ibid.

[26] Geertz, *The Interpretation of Cultures*.

the differences identified between the two groups before detailing the topical findings as well as elaborating on the three parallels, including the epistemological divide.

The Neuroscience Community

Signifiers were identified among the neuroscientist participants. These are variables that symbolize and influence the discourses as well as frame the ways of thinking within the neuroscience community. Neuroscientists possessed a set of languages that was technical and pertained to their specific scientific community. These ways of using language showcased the conventional practices of the neuroscience field and were often used as responses to potential problems or conflicts. For instance, "mapping"[27] referred to the correlation between behaviors and brain activities, and it was used as a practical solution to the mind-body problem. Additionally, many mentioned "operationalization",[28] defining abstract mental phenomena as concrete measurable observations. Operationally defining consciousness was brought up as a crucial obstacle to the current hard problem of consciousness: ideally, through operationalization, an abstract problem, the mind-body problem, would become operationalized as well, removed from what made it hard by focusing on real-world scientific practices.

[27] See Appendix 2.

[28] Ibid.

The Lay Public

Several signifiers were shown among the narratives of the lay participants. The concepts of the mind, the brain, and the soul were attached with meanings that were specific to the lay group.

While the soul was not a part of the interview guide, it was later included since many participants mentioned the concept on their own. Current data confirm the large-scale survey data by Richert and Harris, adding nuances to the existing data.[29] For one, participants who believed or acknowledged the possible existence of a soul reported believing that the soul is more permanent and unchangeable than the mind throughout one's life span. In addition, participants generally assigned cognitive functions (thinking, remembering, decision making, etc.) to the mind and ascribed life-force-related terms (spiritual, transcendent, etc.) when describing the soul. While Richert and Harris' data show no clear associations of reason and emotion with the mind and the soul,[30] the current study shows that reason (in contrast with emotion) is connected more to the brain. Both the mind and the soul were mentioned as loci for people's essence of being: what made a person who they were.

When it came to the mind-brain (body)-soul relationship, lay participants' answers varied greatly. Responses included viewing the mind as the brain, the mind as being in the brain, the mind as being in the whole body, the mind having no location, the brain as a part of the mind, soul as being in the heart, the soul being in the whole body, the soul being in the center of the body, the soul having no location, mind leading soul, and mind drawing upon the soul to produce experiences. Generally, the mind was considered being associated with the brain and the

[29] Richert and Harris, "Dualism Revisited," 99-115.

[30] Ibid.

cognitive aspect, and the soul being associated with the heart and the emotional aspect. As these participants' personal beliefs varied (across agnosticism, atheism, Christianity, and Judaism), their opinions varied.

Neuroscience Inside and Out

The Hard Problem of Consciousness Inside Neuroscience

The hard problem of consciousness describes the problem of addressing the "why" and the "how" of our qualia, or subjective experiences, in contrast to the easy problem which addresses the physical system and mechanisms.[31]

Neuroscientists' opinions and personal beliefs on the mind-body relationship varied to a degree. While no neuroscientists ever admitted to being a mind-body dualist directly, a minority of (two out of eleven) participants in neuroscience explicitly claimed that the mind was more than the physical mechanisms.[32] When asked what the extra part would be, however, they remained agnostic,[33] instead of pointing out the transcendent character of the mind or the soul as some laypeople did. A small number of (two out of eleven) neuroscientists remained agnostic about the mind-body problem. The majority of (seven out of eleven) neuroscientists insisted on a materialist belief. While many (four out of the seven materialists) among them claimed to be brain-centric, some (three) pointed out the equal importance of the rest of the body as well as environmental context.

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[31] Chalmer, "The Puzzle of Conscious Experience," 80-86.

[32] See Appendix 2.

[33] Ibid.

Despite the prevalent physicalist view among the scientists, there was quite a consensus among these participants on the opinion that the hard problem was still hard even in today's state of neuroscience, compatible with existing literature.[34] However, it was difficult for different reasons for different scientists. While almost all neuroscientists (ten out of eleven) acknowledged the existence of the explanatory gap, two types of gaps were identified in neuroscientists' accounts. One type of gap in explanation was due to epistemological reasons. While the view of dualist neuroscientists I summarized prior to the interviews would hold that the lack of neural explanations for certain phenomena must be explained by a separate thing, the mind, my participants would say simply that science could not solve a problem that was in the philosophical domain. This epistemological divide will be discussed in a later section of this paper. A couple of scientists believed that the gap existed since we could never satisfactorily accept any explanations epistemologically because individuals could not verify a scientific solution of consciousness for themselves.[35] Meanwhile, another type of gap was merely one between participants' ontological physicalist belief and our current limited technology and methodologies for studying the mind in neuroscience. Specifically, the limitations cited were the difficulty of operationally defining the mind, the insufficiency of current technology for recording adequate amounts of data, and methods that could only reveal correlations instead of causations.

[34] Steven Pinker, "The mystery of consciousness," *Time* 169, no. 5 (January 2007): 58-62, 65-6, 69-70.

[35] See Appendix 2.

The Public Reception of Neuroscience

Even though there is extensive literature on the influence of neuroscientific representations in the news media on lay people's sense of neuro-essentialism and other issues of neuroethics,[36] my lay participants did not come across neuroscience-related news often in their daily lives. Rather, many (six out of ten) non-neuroscientist participants reported gaining knowledge about neuroscience or the brain from word of mouth (usually their family members or colleagues who work in physical science-related fields). A small number of (three out of ten) participants reported taking one AP psychology course in high school. Some (four out of ten) also reported coming across attention-grabbing YouTube videos and social media postings of popular neuroscience videos or articles that were targeted at laypeople. All participants who were not neuroscientists reported having very limited knowledge of neuroscience. Most (eight out of ten) participants reported being minimally affected by the neuroscientific information they came across in daily life. If the posts or articles seemed not credible or not immediately relevant to themselves, they tended to move on without being consciously affected.

When asked to take a guess as to the current state of neuroscientific progress, almost all (nine out of ten) lay participants pointed out the limitations immediately following the promise of the field. Many postulated that there was still much not known in neuroscience. Some pointed out that the science of the brain was less developed than that of the other body parts or organs. These ideas were generally drawn from personal experiences, such as taking care of relatives with neurological diseases that could not be treated. Further, many participants estimated that we knew the general structures and functions of the brain, but we did not fully comprehend the more

[36] Racine, Bar-Ilan, and Illes, "FMRI in the Public Eye," 159–164; Racine et al., "Contemporary Neuroscience in the Media," 725-733; Beck, "The Appeal of the Brain in the Popular Press," 762–766; O'Connor, Rees, and Joffe, "Neuroscience in the Public Sphere," 220-226.

complex aspects, such as how the brain played into our mind, consciousness, emotions, how people generated knowledge, or why certain brain mechanisms took place.

The Two Discourses

The Brain Discourse

Individuals are simultaneously under the influence of two seemingly conflicting discourses: the dualist discourse and the brain discourse. It seems that brain-related knowledge, whether or not it is accurate or legit, has been integrated into laypeople's lives so much that no technical training is required for people to be able to articulate the crucial biological functioning of the brain. All participants who were not in neuroscience were able to point out some roles of the brain (regardless of accuracy), including that the brain stored information, produced thoughts, or controlled automatic physical functioning.

In addition, when asked about the location of the mind, a number of (six out of ten) participants were inclined to say that it was in the brain. What was most of interest was that all non-neuroscientist participants who responded with such an answer immediately added a qualifier to their statement. Some made it clear that the mind being in the brain was their initial instinct, or "the obvious answer"[37], but they were unsure that they were convinced by this answer.[38] They explained that they did not *feel* that the mind necessarily had a location, but they assumed that if it did it would probably be in the brain (even though they had no idea where in

[37] See Appendix 2.

[38] Ibid.

the brain).[39] One of these participants explained that such a mind-in-brain association simply came from learning.[40] Specifically, growing up, she initially associated the mind with the heart due to how people talked around her (heartbreak, follow your heart, etc.). However, as she grew older, she was then told in school and by others in her life that the mind was in the brain. Therefore, she experienced a shift in knowledge. She clarified that the shift was never a shift in how she felt, as she still did not *feel* the location of her mind.[41] Similarly, when another participant felt tired, she would say sentences such as "I feel like my brain can't make any more connections".[42] This participant explained that she did not feel or know for certain what connections the brain made, yet she talked in this way without even processing the meanings of it. For her, the mind, the brain, and her subjective feeling of tiredness were almost all interchangeable in her discourse.[43]

It is unclear which precedes the other, discourse or knowledge. Do people know about brain functioning because they talk about the brain this way? Or do people talk about brains in their lives because they know about brain functions? These seem to be some chicken-egg problems to which I do not have answers. What is clear from the data, however, is the omnipresent brain discourses that are entrenched among my participants. The mentioning of the heart as a comparison to the brain brought up by a number of participants reinforces such a brain discourse. While non-neuroscientist participants were inclined to reject that emotional feelings were actually located in the heart, they still claimed the associations of feelings with the heart by

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[39] Ibid.

[40] Interview with P21. See Appendix 1.

[41] Ibid.

[42] Interview with P18. See Appendix 1.

[43] Ibid.

justifying that they could feel something in their heart.[44] Similarly, one does not need to truly understand neuroscience to be able to claim that the brain "controls biological functions"[45] or that it "controls thinking and reasoning".[46] Brain knowledge seems to have become common sense.

To the participants, however, discourses on the brain were also considered within the scientific domain. Laypeople, when unsure about the relationship between mental feelings and the physical body, would usually point out that either they did not know enough about neuroscience, or that neuroscience today was still in its early stages. Lay people could identify a distinct scientific community that contained information and values that were different from their everyday information and values. Here, conventional signifiers from the scientific domain (brain discourses) spill over to the lay group and become new signifiers in the latter community with a new layer of meaning. For instance, for lay people, the brain can be explained with their own discourses. Yet, there is another layer of scientific expertise that lay people associate with the brain. The brain, therefore, consists of both layers of meaning for lay people. Consequently, when people confront conflicts between intuition and scientific views, they are able to attribute the conflict to their lack of expertise, avoiding disturbances in their self-understanding[47].

[44] See Appendix 2.

[45] Interviews with P12, P16, P17, P19, P20, and P23. See Appendix 1.

[46] Interviews with P15, P16, P20, P21, and P23. See Appendix 1.

[47] See a later section in this paper titled "Lay People on the Epistemological Divide".

The Dualist Discourse

My data show that people might not be dualists in a strictly Cartesian sense. For one, people's sense of identity is not completely attributed to their mind (or soul, as Descartes put it), but it is more distributed and nuanced than that, as described previously. In addition, it is suggested from the data that participants did not consistently report explicitly treating the mind and the body as two different entities. Moreover, consistent with existing literature,[48] most participants (eight out of ten) mentioned or confirmed the belief in the existence of a soul as a separate concept from the mind or the body.

That said, it is true that neither group of participants could walk around talking about the mind and the body as separate concepts in their discourses. This was true even when the participants firmly believed or leaned toward believing a monist view. There were participants among both the neuroscientist and lay groups who made the distinction between "the cognitive mind" and "the physical body (or brain)", even while claiming that "the cognitive mind" was located or was produced by "the physical body (or brain)". In many occurrences, participants caught themselves getting the "mind" and the "brain" confused when responding to my questions during the interviews. For instance, some would, at the end of a comment, say things such as "I guess when I said mind, I meant brain"[49], realizing their own confusion. A non-neuroscientist participant demonstrated such confused dualist discourse vividly. While this participant insisted on being an atheist and a materialist throughout our conversation, she could not help but use a dualist discourse nonetheless:

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[48] Richert and Harris, "Dualism Revisited," 99-115.

[49] Interview with P18. See Appendix 1.

> …it feels different to be awake than asleep, but the brain is still active… but different things are happening physically in the brain: like when a person is asleep rather than awake. So I don't know... Is dreaming part of consciousness? I don't know! But I mean, my subjective experience is very different when I'm awake. I mean, when I'm asleep, I'm not really perceiving very much, if anything at all. But I guess the brain is still active… but maybe the mind is not active. I don't know. [laugh][50]

Similarly, while a number of participants from both groups (two from the neuroscientist group and five from the lay group) held the view that an organism was one whole entity, they could not escape a dualist discourse either.[51] These participants tended to talk about the mind and the body or brain as their own entities having certain functions, but when asked about their thoughts on the relationship between the mind, the body, and the brain, they were not willing to acknowledge the independence of these concepts. Instead, they maintained that "I feel my person as just one thing"[52] or that "they're all just different facets of one organism".[53] A neuroscientist, for instance, claimed that the sum of the physical activities (the mind) would be greater than the parts (the body). Despite this, she insisted on rejecting a dualist position while still using a dualist discourse:

> The mind: I guess that's our thoughts. You know, uh, people's thoughts about themselves, about the world. The body, I think of as a much more sort of physical thing. And so, you know, the actual physical structures of the brain, organs, blood vessels, bones, all those sorts of things. I think about the mind as being a much more… cognitive… aspect. …the cognitive portion of our minds influences our bodies, um, influences how we feel physically.[54]

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[50] Interview with P19. See Appendix 1.

[51] Interviews with P4, P5, P9, P18, P19, P20, and P21. See Appendix 1.

[52] Interview with P4. See Appendix 1.

[53] Interview with P5. See Appendix 1.

[54] Ibid.

Here, again, the participant distinguished between the "cognitive" mind and the "physical" brain. However, when asked if the two aspects were separate beings, she said, "No, I think it's all part of one organism. Um, they're just different facets of the same organism."[55]

While Bloom argues that infants manifest folk dualism as an innate trait,[56] Barlev and Shtulman, in a recent article, suggest that dualist beliefs are learned, instead of developmentally predetermined.[57] The reason is that while babies perceive minds and bodies as integrated from the beginning, the cultural significance of counterintuitive ideas (such as a disembodied mind) is emphasized through learning. The current study does not address whether folk dualism is an innate phenomenon. However, it does suggest that regardless of whether dualism is innate, it indeed has been successfully transmitted culturally and become accepted as common sense. While we might not strictly be Descartes' babies as Bloom strongly argues, we might just be stuck in a dualist discourse nonetheless.

The dualist discourse can co-exist with the brain discourse, demonstrated vividly in this quote by a lay participant:

> ... I wasn't using my brain out of laziness, but… from then on out, I sharpened up and started doing better in school and using my brain more to think and create my own ideas... And it wasn't… I didn't really do anything to switch it, except for acknowledging… I had the realization… I acknowledged that I could be using my brain better and be doing better. So I made that transition, but that was only really… I guess I didn't change things… I didn't *physically* change anything. [emphasis added][58]

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[55] Ibid.

[56] Bloom, *Descartes' Baby.*

[57] Michael Barlev and Andrew Shtulman, "Minds, Bodies, Spirits, and Gods: Does Widespread Belief in Disembodied Beings Imply That We Are Inherent Dualists?" *Psychological Review* 128, no.6 (September 2021): 1007-1021.

[58] Interview with P15. See Apendix 1.

When asked to clarify what exactly changed, the participant continued his account in a conflicted manner:

> Definitely my mind. It was all really internal thoughts, like just working through that in my brain and talking about it and all that stuff. But I didn't really… I didn't undergo any physical changes in order to try and use it better. It was more just me processing my thoughts and my mind, and that made me… actually…my brain want to be worked and want to be used. So then that change in mind in turn becomes physical changes in the brain.[59]

Here, the participant thought of the brain as its own entity and the mind as a non-physical entity. However, influenced by the brain discourse, he was convinced that the brain was responsible for his intellectual abilities. Influenced by the dualist discourse, on the other hand, he separated the physical brain and the non-physical mind as undergoing two different processes of change. The participant's agency could be seen as being presented in both his brain and his mind, as he occasionally used the term "me" and "my brain" interchangeably by accident. While he described having a change of mind, he initially insisted that nothing really changed (physically). Later, he explained that his physical brain was actually changed through his mind. This beautifully confused narrative showcased both a commonsense knowledge of the brain as a significant source of cognitive abilities as well as a dualist discourse of the mind as a separate thing from the physical brain.

[59] Ibid

The Parallels

Parallel 1: Visible Explanatory Gap in Both Groups

As shown in previous sections, the explanatory gap was extremely salient in neuroscientists' accounts.[60] It is true that there were people in both groups who reported a firm brain-centric view: The existence of this view was not dependent on the participants' professions. Yet, the general trend in the data shows that only a minority of people (two among lay people and four among neuroscientists) from both groups reported firm materialist beliefs. Most expressed either a materialist belief with ambivalence or speculations or uncertainty. The explanatory gap was as salient in both groups: whatever personal beliefs one held, they still expressed a sense of insufficiency in explaining or verifying those beliefs.

Among the lay people, the explanatory gap of consciousness was extremely prevalent. For one, participants often verbalized contradicting statements about the mind-brain relationship. They would assume and claim that the mind just was the brain or that the mind was in the brain,[61] despite later stating an intuitive belief that the mind felt more than just physical or more than could be physically explained. One lay participant demonstrated this in his account:

> I feel like that… the mind has a location but is more than just a physical thing. Um, I feel like the mind is more than just the brain, is more than just all the nerves and gray matter that we have. I feel like it's… it's kind of how it's changed throughout the years… forming who we are and how we're going to continue to change. I feel like it's not just what the brain is right now. I think my mind is kind of like the way I perceive and go

[60] See a previous section in this paper titled "The Hard Problem of Consciousness Inside Neuroscience".

[61] See a previous section in the paper titled "Brain Discourse".

> about thinking about and interacting with reality, not necessarily on a physical level. And then I feel like the brain is home to my mind… And a lot of other things…[62]

Other than intuitions that went against neuroscientific knowledge, some lay participants' accounts coincided with those of the neuroscientists, distinguishing between an ontological and epistemological explanation of the mind. Specifically, they could not fathom how anyone could individually satisfactorily verify a scientific explanation:

> I honestly couldn't even imagine how they would try to explain it. It feels like there would never be a satisfying conclusion: like this is exactly where the mind is, or like what it is… that feels like such a weird concept… science can't capture the whole essence of it… I don't know. It almost feels like the mind is in a separate dimension. Like the brain is the third dimension… like it's inside my head. It's a physical organ inside my head. If you were to cut it open, you could see it there. But it feels like the mind is on a completely different plane that you can't really access because it's in your head, but I don't know where…[63]

Parallel 2: Similar Ways of Dealing with the Gap

The epistemological divide

Participants, neuroscientists or not, either regarded, implied, or actively denied a divide between how we felt (and what we could satisfactorily accept as an explanation) and what we knew (however in-depth such knowledge was). Despite using two different sets of signifying conventions, the explanatory gap of consciousness was visible in both groups. Among neuroscientists, the gap was understood as the result of a distinction between scientific and

[62] Interview with P17. See Appendix 1.

[63] Interview with P21. See Appendix 1.

philosophical explanations. Among the non-neuroscientists, it manifested as a gap between subjective feelings or personal beliefs and the entrenched neuroscientific views.

Neuroscientists, when asked to speculate on the promise of solving the hard problem of consciousness, usually in some way alluded to what I call the epistemological divide. Scientists' accounts were informatively nuanced. Many (six out of eleven) participants posited that, *scientifically*, consciousness would boil down to the physical mechanisms - neurons firing (participants were more optimistic about this aspect of the explanation). At the same time, there would still be things that would remain unsatisfactorily explained, which would need to be addressed *philosophically*. Neuroscience only looked at the phenomena of brain activities, instead of creating theories of how these activities generated subjective experiences.[64] A number of neuroscientists reported that they believed the mind-body problem could be solved, but "solving" the problem did not mean the solution could be communicated to the people for them such that they would understand due to the subjective and felt nature of consciousness.[65]

Solving (or dodging?) the hard problem in neuroscience

When asked if they thought the hard problem was ultimately solvable, the initial answers from these neuroscientist participants varied, ranging from optimism to uncertainty, to pessimism. What was consistent was that all of these neuroscientists were able to find some ways of avoiding the problem in order to continue their daily work. These included justifying the irrelevance, dodging the problem by accepting its assumptions, focusing on narrower pieces of the bigger puzzle, and focusing on correlations instead of causation.

[64] Interview with P6. See Appendix 1.

[65] See a previous section in this paper titled "The Hard Problem of Consciousness Inside Neuroscience".

The epistemological divide outlined above among the neuroscientists serves as a solution to the problem itself. The divide justifies a lack of action: the philosophical questions are not within the scientific domain.

A prevalent opinion that the hard problem of consciousness might be strategically dodged by scientists was also observed. One participant expressed "dodging the problem" as a way of meeting the problem. While her research explored the visual perception of mice, she understood fully that the neural basis of subjective "perceptions" she claimed to be studying was an assumption. While she knew her research only addressed the easy problem by finding associations between neural activities and the behaviors of the rats, she still presented her findings as those for subjective perceptual experiences. The quote below demonstrates her conflicting, ambivalent attitudes on the relevance of the hard problem of consciousness:

> I kind of see this interesting, uh, juxtaposition here because I say that it requires a philosopher to solve this problem. But in my paper, I was really trying to claim that there is subjective [experience]…. So I'm dodging the hard problem and just trying to kind of solve this soft problem by saying, see, there is a different mapping between the physical body and, uh, the perceptual quality of, uh, an experience… It is salient in my research because I dodged it, I guess.[66]

Here, it is vividly shown that the philosophy-science divide was clear to this participant. Yet, while realizing the gap in explanation, neuroscientists move on with their work putting the philosophical aspect on the side. They fix the problem by "dodging it", focusing on the concrete, physical, easy problem ("mapping") instead. Subsequently, the above-mentioned neuroscience participant provided me with an account of the practicality of actions in her professional context:

> Um, I don't have a really good way to explain the hard problem. I think we can start by looking at the soft problem and see if we already found a solution to the different physical properties of different contexts and using different subjective experiences… and

[66] Interview with P6. See Appendix 1.

> use that to inform what is the exact mapping or physiological state associated with, uh, uh, mental state. I guess… So looking at the correlation first, instead of directly going for it – like I know the answer causation style.[67]

Indeed, many took a step back from the epistemological difficulty and focused on the practical difficulty of what made the hard problem hard: it was hard to operationalize consciousness since the mental phenomena were impossible to be "distilled out".[68] Here, it is shown again how the pattern of justification is embedded in the conventional language of the scientific community. The idea of operationalization provides not only a practical guideline in science but also a way of thinking and problem-solving.

Another approach to a solution was identified as working in the same vein. There were participants who pointed out that their work served as one piece of a bigger puzzle that was the human mind. For instance, the account below is from one neuroscientist who brought up the Gestalt idea, describing the mind and what made us who we were as involving more than the sum of the different physical parts we were able to study now:

> You can at least find one specific piece of the puzzle. So, you know, you're not able to identify everything that's going into it, but we can narrow it down and say, well, at least this one small piece of the puzzle is involved. And then, you know, I suppose the hope is down the road, enough different investigators will have picked different pieces of the puzzle, and we can start putting them together to at least capture more of the system.[69]

When asked to clarify what the missing piece would be, the participant stated that we did not know what that would be at the moment. Participants did not seem to be too bothered by such agnosticism. A few of them simply admitted how personal their opinions were: It is true

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[67] Ibid.

[68] Interview with P8. See Appendix 1.

[69] Interview with P5. See Appendix 1.

that we could not at the moment pinpoint the missing pieces of the puzzle that constructed the mind, but where else would the mind be if not in the brain?[70]

Many (six out of eleven) neuroscientists, on the other hand, were not bothered because the explanatory gap was not relevant enough to their research at hand for various reasons. For scholars who focused on the molecular level, movements produced by the spinal cord, or phenomena that were not conscious (such as drug tolerance), the gap was not salient to them as consciousness was not a concept that appeared in their work at all.[71] For these scholars, "the biological component is there and will function the same way, regardless of whether we know how it relates to, ultimately, the production of qualia, or experience."[72] For some other scholars, the gap was relevant, but they still did not think about the problem as much daily.[73] A couple of neuroscientists pointed out that the explanatory gap was definitely relevant to the larger goal of neuroscience, but they were confident in solving the problems in their day-to-day work regardless of whether they had an answer to the deeper question.[74]

Laypeople on the epistemological divide

Similar to the neuroscientists' solutions (avoidance?) and fallbacks, as outlined above, lay people also had ways to make sense of or dodge the conflict between their intuitions and their neuroscientifically informed commonsense knowledge. For one, laypeople managed to make

[70] Interviews with P1, P7, P8, and P11. See Appendix 1.

[71] Interviews with P1, P3, P7, and P11. See Appendix 1.

[72] Interview with P7. See Appendix 1.

[73] Interviews with P3, P5, and P8. See Appendix 1.

[74] Interviews with P4, P7, and P13. See Appendix 1.

sense of the gap in explanation by justifying that science might not be able to explain everything. While neuroscientists who held the same view tended to assign explanatory responsibility to the field of philosophy, laypeople participants tended to attribute the explanatory gap to the non-physical property of the mind.[75] Another approach laypeople adopted was to justify their gap in understanding with their lack of expertise. They believed that since there must be a well of neuroscientific knowledge they were not aware of, it made perfect sense that they could not fully explain the mind-body relationship. Again, the divide between the limit of our knowledge (either in science generally or in ourselves) and the truth to be known out there serves as a solution to the problem itself, just as it does among neuroscientists. The conflict was, again, not often salient in lay participants' daily life. They did not think about the mind-body relationship frequently, and whenever the gap arose, they similarly dodged the conflict:

> ...I'm not an expert. I don't know everything about neuroscience, so I can't readily say 'this is happening exactly because this specific process is happening'. Sometimes when I only know a little bit about [neuroscience], I'm like, yeah, this is probably because of this. But if it doesn't feel like it is because of that reason, I don't really think too much about it. I'm like: maybe it's something else. Maybe it is something else that could be logically explained. Or maybe it's something else that can't be… that is more theoretical.[76]

The science-philosophy dichotomy in the neuroscientist group corresponds to the thinking-feeling dichotomy among the laypeople. Similar to the neuroscientists, a minority of lay participants (two out of ten) insisted on a materialist belief: all experiences have a physical explanation. Among laypeople, there is a connection between such a belief and atheism: How else would you explain it? The majority of (seven out of ten) lay participants were inclined to lean toward a brain-centric theory logically but intuitively could not discard the feeling of a

[75] See Appendix 2.

[76] Interview with P16. See Appendix 1.

non-physical mind. While the entrenched brain discourse propelled them to think that the physicalist view was the correct view, they tended to point out that they experienced consciousness despite it. This logic-intuition dichotomy was extremely salient among participants with complex mental health histories. For instance, a participant who was in recovery from alcohol and cocaine abuse logically pointed out that his brain was merely a series of channels and electrical signals leading to a biological disease (drug addiction).[77] Yet, he experienced the desire for drugs via thoughts. He reasoned that the brain activities manifested in himself as thoughts and desires, but what really happened was probably simply the brain craving something else.[78]

While all non-neuroscientist participants were able to describe the significance of brain functions in one way or another, many reported an unwillingness to accept a materialist view. Specifically, participants distinguished between a "brain" that controlled some biological functions and a "me" who was actually doing these things. Consistent with existing literature,[79] participants' accounts of their understanding of the brain-self relationship emphasize a sense of agency. Such agency is important to the participants in a personal way, influencing which pieces of neuroscientific knowledge they are comfortable receiving and accepting, and which pieces of information they are willing to put aside and attribute to the young age of neuroscience. Scientific information that is inconsistent with the agency model of conscious state attribution (our tendency to decide that entities that have agency are conscious) is rejected.[80] Since the

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[77] Interview with P23. See Appendix 1.

[78] Ibid.

[79] Adam Arico et al.,"The Folk Psychology of Consciousness," *Mind & Language* 26, no. 3 (June 2011): 327-352.

[80] Ibid.

participants were conscious, they were entitled to agency, which neurons firing in the brain could not provide. For instance, one agnostic lay participant demonstrated such ambivalence in the reception of brain-related knowledge:

> …I have studied psychology, not in an extensive way, but I know some of how the brain functions. Um, and I know that most of it is, you know, it's based on… like electrical pathways between neurons and stuff like that. Um, but it's difficult to think about it like it's just the electricity, kind of, in you. So I'm more inclined to think that there's something further than that, that's motivating your decisions. Um, so kind of… I guess kind of thinking of it as if you have a control panel that has lights …and determining which light turns on is …which switch gets turned on. But what turns the switches up or down that I feel is something else.[81]

Similarly, there were participants (neuroscientists or not) who sought comfort in holding onto the sense of individual agency by justifying the meaning of free will. For instance, a neuroscientist talked about his personal experience of being depressed overcoming to believe, during his scientific training, that people did not have free will:

> ...I got out of it. I felt better. And then I thought, well, maybe it's just telling us – to remain sane, I have to pretend that I have free will. …I have to just be comfortable with the idea that I have freedom, but I don't really have freedom. [laugh] …anyway, I'm fine with it now. Um, because, again, you know, my choices are mine. I make my choices. Uh, they're different than the choices you would make or somebody else would make. And so that gives me comfort even though they're not free.[82]

Parallel 3: Brain Discourse and Dualist Discourse Upon Both Groups

One constant among all participants was a consistent dualist discourse with a conflicting, unsure sense of scientific and physical understanding. In other words, it seems that it was impossible for participants to talk about the mind-body relationship without using a mind-body

[81] Interview with P16. See Appendix 1.

[82] Interview with P13. See Appendix 1.

dualist discourse, even for the firm monists. At the same time, all participants expressed some level of understanding of the brain and its role. Even those who had never had any neuroscience training in any capacity were able to explain some basic functions of the brain and its great importance in life.

For both groups, there are two forces at play simultaneously: the dualist discourse and the brain discourse. While it is unclear if dualism is an innate instinct or a learned trait, it is clear that the values of both discourses are reinforced through learning. For neuroscientists, the brain discourse has a deeper impact due to their training in neuroscience. Therefore, it is not surprising that individual differences exist in both groups while, at the same time, parallels are seen. In other words, not all scientists are strictly monists, and not all laypeople are explicitly intuitively dualists. The attitudes of a person do not depend entirely on their professional training. While professional training influences the conventions and practices participants use to describe and justify their attitudes, the attitudes of a person are influenced by the weight distribution of the two discourses. The weight distribution, on the other hand, is dynamic and depends on personal histories and past experiences. Due to the coexistence of the two discourses, the narratives of all participants were extremely nuanced, sometimes even conflicted. People resolve the conflicts between the two discourses in a similar way, namely with the epistemological divide, but with various manifestations: firmly holding onto one firm belief, citing the insufficient progress of science, dodging problems in practice, finding comfort in holding onto individual agency, etc. Sometimes when these conflicts did not get resolved, participants reported having periods of time struggling with maintaining a positive or comfortable mood.[83]

[83] See Appendix 2.

Shtulman, commenting on the progress of science education, argues that tendencies in the lay understanding of cognition provide obstacles to science education.[84] While the current study supports some hindering factors he listed, such as incompatible folk theories, it shows that obstacles, such as tolerance for contradictory explanations, are shared among scientists and laypeople.[85] Both the dualist discourse and the brain discourse are at play for both communities, despite their different conventional variables within these communities. Science is shown to be its own community, but it is not isolated from the rest of the world. Rather, it is embedded in it while possessing its own signifying conventions.

Affect Matters

Affective factors play a role in how participants thought about the mind-body relationship as well as the gap between science and feeling. While the brain discourse and the dualist discourse influence people in an omnipotent fashion, affect affects what viewpoints present people are willing to accept and integrate into their identities. The most prevalent emotion that was mentioned by the participants was a state of crisis or depression which occurred most frequently when a conflict appeared. Most participants claimed it was depressing to think of the human mind as "machine-like",[86] or "just electricity".[87]

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[84] Andrew Shtulman, "How Lay Cognition Constrains Scientific Cognition," *Philosophy Compass* 10, no. 11 (November 2015): 1-14.

[85] Ibid.

[86] Interview with P19. See Appendix 1.

[87] Interview with P16. See Appendix 1.

On the other hand, some participants found a physical basis for the mind a comforting concept during hard times. A couple of participants considered viewing the mind as pure chemistry in the brain a positive way to think about mental illnesses, as it relocated the responsibility of managing mental health issues from the willpower of the individual to the biological intricacies of the brain.[88] In this way, mental health symptoms, such as depression, rather than being seen as a personal failure, became something that could be managed with external assistance. This did not mean that these participants considered themselves as purely physical beings. Rather, learning about their brains made them feel as if they were a complex organism that they themselves were not completely in charge of.[89]

Conclusion

In conclusion, the findings of this qualitative study show important parallels between the neuroscientist group and the lay public groups. Specifically, the explanatory gap of consciousness is salient in both groups. Crucially, the epistemological divide is utilized by both groups as a mechanism against the explanatory gap, allowing for the existence of the two conflicting theories, namely folk dualism and folk neuropsychology. Additionally, both monists and dualists exist in both groups. Whether a participant is a dualist or a monist does not entirely depend on their profession. Instead, it is dependent on the weight distribution of the two discourses: the brain discourse and the dualist discourse. Both groups are under the influence of both discourses: they act as forces upon the two groups as well as environments in which the two groups bathe. At the same time, each group does have its own signifying conventions and

[88] Interviews with P17 and P18. See Appendix 1.

[89] Ibid.

practices which influence the participants' ways of thinking and presenting themselves. Yet, the neuroscientific community is not isolated from the rest of the world: it may appear so merely due to its unique signifiers and, again, the weight distribution of the two discourses.

Appendix 1

Table 1. Neuroscientist Participants Information.

Participant #	**Research Focus**	**Date of Interview**
P1	Neural control of movement (in fish)	03/24/2022
P2	Psychoactive drugs	03/16/2022
P3	Cellular & molecular neuroscience (in fish)	03/23/2022
P4	Epilepsy	03/22/2022
P5	Eating Disorders	03/30/2022
P6	Olfaction (in rats)	04/05/2022
P7	Purkinje cells	04/08/2022
P8	Visual perception (in mice)	04/04/2022
P11	Drug tolerance	04/18/2022
P13	Motor control	04/15/2022
P14	Visual perception (in mice)	04/20/2022

Table 2. Non-neuroscientist Participants Information.

Participant #	**Profession**	**Date of Interview**
P9	Graduate student of English	04/20/2022
P12	Retired professor of religion and society	04/22/2022
P15	Undergraduate student, education major	04/22/2022
P16	Undergraduate student, Japanese and Asian studies majors	04/20/2022
P17	Undergraduate student, urban studies major	04/20/2022

P18	Undergraduate student, political science major	04/22/2022
P19	Undergraduate student, chemistry major	04/20/2022
P20	Undergraduate student, international studies & environmental studies majors	05/11/2022
P21	Undergraduate student, sociology major	04/18/2022
P23	Graduate student of sustainability management	04/22/2022

Data of all participants were kept anonymous. Participants were numbered according to the sequence of their recruitment. Some non-scientist participants were recruited prior to a few neuroscientists. Data from only 21 participants were eventually collected and utilized for this study: P10 and P22 dropped out during the course of the study.

Appendix 2

Supplementing Interview Quotes in Support of Findings

Some exemplary quotes from interviews with participants are presented below as supplementary material in support of the paper's findings. Only selective examples are shown here. The examples are organized by section titles in the paper.

The Neuroscience Community

"Mapping" interview example from P6:

> Interviewer (I): Okay. Um, so do you think like this, uh, this kind of [mind-body] relationship, like, do you think it affects you what you do and your work?
>
> P6: Yeah, definitely. Um, because it's kind of essential what I'm trying to study, right? So there is this physical property of chemical, which is, I guess, the body. And, um, there are different mental representation of the same physical thing. So it has to be an interaction of, um, uh, there has to be some different mapping between the mental, mental representation and the physical world… and how we create a mental representation is through the interaction of the chemical with our body and then our, uh, neural network associated with the different processing methods… different mental representation. So. Um, yes. I would say definitely informed what I'm doing by thinking about this mental representation mapping problem.
>
> I: Yeah. Just to, um, clarify a little bit, like, could you just say a little bit more about this mapping concept?
>
> P6: Yeah. Well basically what I'm thinking is that, you know, uh, there are different represent… well, I guess I should not use those like really vague terms. Um, there are different perceptual quality of an odor, uh, and In order to generate this different perceptual qualities, it requires your body interacting with the physical stimulant in a certain way. It requires your brain react in a certain way, coordinate in a certain way. So that's what I meant by mapping
>
> I: Okay. So it's like mapping your…
>
> P6: …perception. Well, the perceptual quality of perception on physical body and context and environment interactions.

"Operationalization" interview examples from P8:

> …in neuroscience we need operational definitions of things. Uh, so I studied the visual perception. Okay. That's like a high level, um, problem. Uh, that's, you know, very, you know… part of consciousness it's like perception, you know, but we were, we were able

to use the word perception because we operationally define perception as… Um, uh, the ability to act upon a, uh, sensory stimulus. So it's like the ability to like, for an animal to generate a behavior and response to a stimulus and us inferring that there must've been a perception linking the stimulus to their ability to generate a behavior and response to it. So that's an assumption and that's like a lot of philosophers would be like, that's not perception. Um, which is true, I guess, but you know, we're calling that perception, but, uh, when you have an operational definition consciousness, it's like consciousness is this sort of whole like bundle of different capacities, um, that, you know, we are like… operational definition is like what, like someone would be able to report it or something. It always depends on some kind of behavior. And I just think fundamentally we won't be able to explain anything about consciousness separate from the behavior that we're measuring. So it's vocalizing that they're conscious of thing or making some report or something. I just think it's ultimately tangled up with this, these other capacities that we have, and we won't be able to distill out this fundamental thing, which is consciousness.

…I think that there's disconnection. Um, we, you know, there's much more complexity than we can operationally define. Uh, let's get back to operational definition because I think this is an important component. So, um, uh, in science you need this repeatable process that you can observe. Generally speaking, people are getting more nuanced and their ability to, uh, causally linked to things that even if there's a million other factors that are like communities that are related to the link of a brain and a mind, for example, you can like maybe control these other factors, these fancy statistics… but generally speaking in science, we relied upon this, um, ability to, uh, repeat the measurement of the same process. Sort of like isolate the process. We call that like the operational definition. Um, and so like, if we want to have like… when to study generation of movement, we can have someone tapping a finger while they're in an fMRI machine and just have them tap the finger starting from the same place, ending at the same place, and just doing it over and over. And then we could, with enough averaging, take out all this extraneous things, because maybe you have some intrusive thoughts that you're thinking about, like, did I leave the oven on like right when you're tapping the finger one of those times, so you can't rely on a single trial cause there's going to be, you're going to… if you have a snapshot of what's going on the entire brain, when that's happening, you'll have the finger moving, but also thinking about other things, and maybe what you're seeing… a little bit and stuff like that. So you need to average out all that stuff by having to repeat this over and over. And so the disconnection is that there's a lot of complexity and nuance that isn't repeatable easily. And so in neuroscience we'll have to only study the easily repeatable processes. So, yeah, it's, it's hard and that's sort of like, it's hard to isolate the thing that you want to study. Um, and when it's consciousness, it's like, yeah, I don't know. It's really hard to study.

The Hard Problem of Consciousness Inside Neuroscience

Mind as more than the physical mechanism example from neuroscientist P5:

> I: So do you think, um, do you think it is the, like, are, do you think that like our ultimate goal is to be able to eventually do that [having specific biomarkers or other objective measure that we can use for mental illnesses]. Or do you think that is not…
>
> P5: I don't know that I think it will ever be possible to fully do that. Um, because again, I think it's probably a situation where sum's greater than the parts. That there is, you know, there's, there is the kind of biological stuff going on, but there's probably something that may not be capturable by science. At least not by any sciences that we have now.
>
> I: Yeah. What do you think that would be like? The part that's more than the whole, like what, what would that be?
>
> P5: I think it is that sort of consciousness, that sense of self that, that, um, you know, the, the, the things that separate us from other mammals, um, that kind of make us, I don't know. Um, I don't… make up who you are.
>
> I: So, um, from my understanding, what you're saying, like, it sounds like you think that what, like what makes us, who we are is more than the combination of all the pieces in this puzzle. So, so like with that in mind, what do you think would be kind of the key to fully understand, for example, a specific type of mental health issue or eating disorder or whatever it is? Um, would it still be like to understand all the different pieces of the physical aspects, or like, is this something else? What do you think the key would be?
>
> P5: I mean, you put it that way, then, yeah, that would suggest that we need to figure out what the thing is, the thing that doesn't get put together with the pieces of the puzzle, um, and figure out how to measure that. Um, but you know, I don't, I don't know that we know how to measure that right now.

The gap existing due to our inability to satisfactorily accept any explanations epistemologically example from P7:

> I: So do you think this [mind-body problem] is a problem that is solvable eventually?
>
> P7: Yeah. That's, that's an excellent question. I think it is. I think it has to be. Um, I, I don't believe in, so I, I try not to be a dualist, um, which is hard because it really feels correct. Um, but I don't believe in a spiritual explanation of human behavior. I don't think. I mean, I, like, I, I believe that there are definitely aspects of physics that we don't understand fully. You know, we used to think pure determinism was true in the, like with the success of the quantum mechanics We know there's also randomness involved. So I do believe that our understanding of how things… causal events will change. Um, but I don't believe there's a spiritual component. So I do believe that there has to, we have to be… There will ultimately be some kind of physicalist explanation because I think it is

physical… the mind, the brain, everything that comes from has to be physical, what that physics of the physical is, I don't know. Um, so I believe there has to be a physical basis for all of that. And therefore it has to be capable of being explained. It might be nearly impossible methodologically to actually do that. But I think it's possible. I think it's not impossible. I don't think, I think it's very likely that the explanation we could eventually get would not be very satisfying. I think that's possible. …what, um, what a solution to the mind body problem might look like is that it has an actual mechanistic explanation… I think it's possible that it could really explain, it can close the gap, but I don't know if it will be satisfying for us to have closed the gap. I, I'm not quite sure how to separate those, but if it's not satisfying, then surely you haven't closed the gap.

I: So you do think eventually there has to be an explanation to close the gap, just for now it's not satisfying, if I'm understanding you correctly?

P7: I think even when we do solve it… I do think it will be solved or it can be solved. I don't know if it will be, but I think it can be, uh, um, I think that when it is… so, so currently it's definitely not satisfying because we're nowhere near solving… Um, but even if we were to solve it, I think the explanation we have might still not be very satisfying.

I: So, I guess I'm wondering, like, what do you mean by solving it, if it's still an unsatisfactory answer?

P7: That's a good question. I, I, I don't know how… I think I just need to think about that for… I think it's probably something akin to… how we can explain… This isn't exactly what I was going to say. Like, we can explain what a flavor is, where, where it comes from, like what components… some of food aren't producing the flavor that we're experiencing. Um, but just describing the mechanism isn't satisfied. Like doesn't give us the feeling of that taste, for example, um… I was going to say, that's analogous. It shouldn't be a problem, but it actually is like, literally… I think part of it is that, um, we might be able to, to, to solve the problem, would be to explain the mechanisms throughout the steps. To explain how our experience emerges from behavior, but ultimately our actual experience doesn't have access to all of those mechanisms, right? Like, I don't know how my brain is working. I can't, I can't introspect what processes are going on in my brain the way someone could, if they put me in it in an fMRI or something. So I think we can get an explanation that provides a full mechanistic path and it might even, and if someone explained that path properly to just a person on the street, they might be able to say, oh, that makes sense. Um, I can see how that happens, but then when we introspect about this solution that we have for the gap, we can't, we can't fully, we can't fully introspect that all of the elements that are involved so we can have a full explanation. It can make sense, but it won't. Um, We can't independently verify it in our own self. So, but maybe that's still a gap.

I: Yeah. Yeah. I think I understand what you're trying to get at. Um, but just to clarify, so, so eventually you think everything, like how the brain works, for example, would be

completely understood, but the gap would still be how we subjectively feel this explanation… to like, to make sense of it. Is that kinda what you're saying?

P7: Yeah. I mean, the gap is the difference between knowing the mechanism and knowing the experience, or how the experience is. I think… I guess, I mean, maybe, maybe I'm making a semantic argument, that there are two ways of solving the gap. One is actually being able to explain scientifically what builds conscious experience. Why, why things feel the way they do. And then the other half of the gap, and this is maybe what isn't answered is… I think we can't make an individual person fully understand what the explanation would be because of like, like I was describing how we don't, we don't have introspective access. We only know the final product and we can explain how the product comes to be exactly. But if we only know ourselves, our own… and not the parts that build it up, then we can never be fully appreciate all the things that produce experience. So I can understand in a logical way. Yeah. So it's the dynamic interaction between at least five areas of the brain at any given time. And they have various recurrent connections or something like that. You're like we have our explanation and I can logic it out and say, yeah, that makes sense for how that would produce qualia. I think that it's possible that we can do that, but that still means I can't feel those areas acting. I can't feel the recurrent paths or whatever. And so I think it would be unsatisfying. The explanation would be unsatisfactory. Yeah. And so maybe yeah that does mean the gap can't be fully closed. …That's probably what can't be explained: What it's like to be a human consciousness that doesn't have access to the things that build consciousness, even if we know fully, can explain it fully, how it comes about.

The Brain Discourse

"The obvious answer" interview example from P19:

P19: I guess the brain is the obvious answer. Cause that's the… like the control center, but um, where does it come from? That's also a great question. Um, I mean, I, I'm just thinking about, I mean, I don't think it's like an intangible place. I don't have a great answer for you. I feel like maybe it is not… It's not like in a specific place. Um, it's the, the whole body I would, I would say. Maybe.

I: Yeah. Yeah. So you started with saying like, you don't think it has a location: what do you mean by that?

P19: Well, I think I'm still confused… because, um, I… scientifically, I feel like there isn't some magical thing that is somewhere in my body that has thoughts. I figure it kind of comes from something that my brain is doing. So it's probably integrated throughout the body. So I guess the location would be everywhere?

Feelings associated with the heart example from P16:

I: So the mind, you would say it's in the brain, but what about the soul? Is it the same?

> P16: No, I'm inclined to say that the soul goes through the heart. And I feel like this is… I think it's interesting because… I don't know. I think it's really interesting that, um, a lot of people instinctively kind of associate that, like when you have feelings or something that you can't really describe with like specific, um, bodily functions, like I don't know, feeling loved, feeling happiness. Um, I think it's really interesting that you associate that with like feeling it in your heart. Um, so I'm not sure if that's like a real, if that's actually the truth, but I think it is true that a lot of people feel it in that, um, including myself. I feel like it does come from that area…

Laypeople on the epistemological divide

Attributing the explanatory gap to the non-physical property of the mind interview example from P12:

> I: Okay. Let's go back just a little bit and talk about, uh, how would you explain the connection like between your mind and your brain? Cause now that we're talking specifically about the brain, I know we kind of touched on a little bit on like the relationship, like with mind and body and social context, but what would you say, is the connection between your mind and your brain?
>
> P12: Well, I mean, it, brain activity is, uh, I don't think the mind, as I said, I think the mind is a bigger category than just brain activity because it, the mind, um, is, makes sense of what it is receiving in, in particularly in moral ethical worldview terms. Um, and so, and I think that the, as I said, the mind, um, is a category where I would, uh… an entity… I would say has a capacity for some transcendence that is some capacity for self consciousness. And, um, but of course, this is all about brain activity, but I, I don't want to reduce everything to brain activity because then it becomes deterministic. and, um, and just as I, uh, would reject the kind of life chances, social research that tries to predict where somebody will end up, uh, in their lives in terms of earning capacity and everything based on these variables before they were five years old, you know. So I don't think, uh, I resist that kind of determinism. So yes, they're very related. Um, and I resist separating them out, but I don't wanna reduce the mind to just brain activity.
>
> I: Right. Yeah. So what would you say the… if the mind is more than just brain activity, what is the part that is more than that? Like what, what, what is that part… the extra stuff?
>
> P12: Yeah. The extra stuff. Um, I think it would, it would be that, uh, the interpretive part, the transcendent part…

Parallel 3: Brain Discourse and Dualist Discourse Upon Both Groups

Struggling emotionally with unresolved conflicts interview example from P18:

> …when I was 19, I spent a week totally by myself on accident and sort of had like a big crisis moment where then I, I kind of started to like, think about like… before that I

would've said like I'm an atheist. Like I. Like things just are what they are. Like the material world is all the matters. And then I sort of… everything sort of crumbled. And then I was like, oh man, maybe there's more going on. Like, um, maybe this isn't the exact question that you're asking, but, um, yeah, I started to think about myself. As way less of a like predictable discrete unit. Um, yeah. Less of a machine and more of a, yeah. Basically categories just started to like totally disintegrate for me. …Yeah. I don't know how that change happened. It was, it, it felt terrible. I mean, I was like, uh, I, it felt like the world was totally, totally falling apart.

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