

GUEST COMMENTARY

READING BRAIN SCANS FOR INTENTION IDENTIFICATION: A TALE OF TWO ANTHROPOLOGIES

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On February 8th, 2007, the Max Planck Society released a statement summarizing the results of a study¹ headed up by neuroscience researcher, John-Dylan Haynes. According to the report, the Haynes experiment demonstrated “how and where the brain stores [a person’s] intentions.” The study’s conclusion—“that spatial response patterns in medial and lateral prefrontal cortex encode a subject’s covert intention in a highly specific fashion”²—followed from an experimental design involving eight human subjects, all right-handed and with normal or corrected to normal vision. The participants’ brains were scanned using magnetic resonance imaging (MRI)³ while the subjects were instructed (1) to decide (a) whether to add or subtract numerical figures that would eventually be supplied and (b) to hold that covert intention for a variable number of seconds; (2) to carry out the chosen task after two 2-digit numbers were presented on a screen; and (3) to indicate which task they had chosen by pressing the button corresponding to the correct numerical figure for the respective addition or subtraction task they had decided upon and performed. With the coupling of functional magnetic resonance imaging (fMRI)⁴ to sophisticated decoding algorithms, the researchers were able to decipher the structural and functional neural correlates of the various participants’ covert addition/subtraction intentions with 70 percent accuracy.

Here, I want to contribute to the ongoing public debate surrounding fMRI for intention identification not with an ethics assessment of its current and prospective applications⁵ but with an eye toward resolving the larger socio-ethical issues it spawns. Toward that end, I contrast a materialist view of the human person and human thought with that of an immaterialist⁶ anthropology. Second, I identify the basic error underlying a materialist interpretation of the data generated by the Haynes experiment and how an immaterialist perspective avoids that error. Third, I explain why only an immaterialist view of the human person satisfactorily resolves the crucial psychological/metaphysical questions raised by the Haynes study, viz., how the brain activity pictured in a fMRI scan *relates to* the person’s mental act, his freedom, and his essential nature.

Anthropological Backdrop: Materialism vs. Immaterialism

Neuroscientist and psychologist Alan I. Leshner argues that recent advances in real-time neuroimaging techniques have led to “the near demise of dualist views of mind and body.”⁷ In other words, the results of brain scanning techniques—making it possible to observe the structure and activity levels in various parts of the brain while the person is awake, thinking and behaving—impugn the theory that the mind or intellect is an immaterial causative factor behind thinking. When the Haynes study results are measured according to Leshner’s pan-material ruler, the intention of each participant to add or subtract is seen as nothing more than an observable effect from neurobiological causes. And, as Leshner’s logic dictates, if intention resides in the brain, then there is no distinction between the physiological substrate of the intention and the intention itself. Accordingly, Leshner avers that the empirical nature of fMRI scans for intention identification—what is observed in the brain scan is the intention—compels both scientists and non-scientists⁸ to conclude that “their minds reside within their brains.”⁹

Benedict Ashley, realist philosopher and educator, gives an opposing analysis of how the observable data from the Haynes study relates to its participants’ covert intentions and, by extension, how the participants’ brains relate to their minds.¹⁰ Ashley’s starting point is our commonsense experience of self as a singular person who is *at once* material (bodily) and immaterial (spiritual). On the one hand, we are aware that, like the other animals, we are composed of a body with its internal and external senses that confine us to a particular place and time. But, on the other, we also know that we differ from all other animals since, with our mind’s capacity for abstraction, we can transcend those temporal-spatial limitations completely. The union of our material body and spiritual intellect or mind *requires* that abstract thought, though originating in the immaterial intellect, be accompanied by the simultaneous set of perceptual (material) thought processes produced by the secondary senses that are seated in the brain. In this way, the human neurobiological processes generate perceptual images from the particulars of sense data; this sense data provides the requisite material images for the formulation of concepts or ideas. In reference to the Haynes study, then, Ashley argues that the material, perceptual thought processes produced by the brain and visually recorded by the brain scan are the instrumental, not direct, cause of the participants’ immaterial decision to add or to subtract. Therefore, we *might* (all technical and functional hurdles notwithstanding¹¹) be able to infer the person’s intentions from the spatial brain activity revealed in these scans—not unlike the way we can figure out what a person is thinking from what they are manifesting in physical words or signs.

I think the best way to understand the relationship between the mind-brain processes involved in human intention is to reconstruct their interactive dynamic in a particular decision, here, in an intent to murder.¹² The murderer, Mr. X, imagines his victim dead and compares this to imagining him alive and the mental stress of continuing to be annoyed by him in the future. Using his *imagination* in this manner, Mr. X refers to his *memory* of past injuries that the prospective victim (Mr. Z) did to him, which memories rely on his brain’s

common or *synthetic sense* to combine information about the real world gleaned from his primary, external senses of sight, smell, touch, hearing and taste. He remembers, then, what Mr. Z looked like, sounded like, smelled like, felt like, etc. Once his *synthetic sense* processes this particular sense information into a composite image, Mr. X's *evaluative sense* registers that image as hateful. But while he is imagining his victim dead or alive and the various ways he might kill him, Mr. X also imagines what it would be like to be caught, tried and electrocuted for murder if he goes through with his decision. All the while Mr. X imagines, remembers and evaluates these things, his *affectivity*—his emotions—are producing *bodily changes* through his hormonal system, some positive, some negative. It is important to note that, at the very same time Mr. X is thinking on the perceptual (brain) level just described, he is also *thinking abstractly*, or on a mind level, about all these things. He reasons, 'Mr. Z, the person I hate, is a member of the human race just as I am and, hence, to kill him is morally wrong and unjust.' But, as the moment of decision arrives when Mr. X knows he must act or abstain from acting, he performs another immaterial act of the will in continuing to imagine Mr. Z as hateful and thinking of him as a wretched individual deserving of death. When this last evaluative image is the center of his attention, Mr. X dismisses the possibilities of getting caught and punished as trivial considerations. So, he carries out his act of free will to murder by taking out his gun and shooting Mr. Z.

Ashley points out that if we were scanning Mr. X's brain during¹³ the coterminous perceptual and conceptual thinking processes just described, the activity we would see in Mr. X's brain scan would not be a picture of his decision to murder for, obviously, we have no way of taking a picture of an immaterial thought. Hence, we would never be able to know directly from the MRI scan what is in Mr. X's spiritual intelligence and will, but would only be able to *infer*¹⁴ these from studying those physical brain states that are the instrumental causes of his moral judgment and decision to kill Mr. Z. So, too, the real-time MRI scans of persons' brains during the act of decision-making, like those of the Haynes study, are not visual representations of their actual decisions but of their accompanying material acts of perceptual thought that are seated in the brain.¹⁵

What anthropology and human psychology—the account of the human person and human intelligence—ground the Leshner analysis of the Haynes experiment? If the mind (and its act of intention/decision) reside in the brain—that is, if human intelligence is a material organic power—there is no immaterial component of human intelligence and, by extension, no spiritual dimension to the human being. And if the human person is a material body only, then the nature of a human being and human intelligence can be explained comprehensively by material, i.e., bodily causes alone. And because humans only have a brain and not a spiritual intellect, they differ from animals not radically, but only in degree; not essentially, but only superficially. Human beings exhibit more sophisticated behavior and think better than chimps only by virtue of possessing larger and more physiologically complex brains, not because humans have some unique immaterial causal powers of intelligence and freedom making them superior to chimps.

What anthropological and psychological perspectives ground Ashley's critique of neural experiments like those of Haynes? As we have already noted, Ashley argues that the only way to fully account for the facts of conceptual thinking and freedom is to posit the direct causal power of an immaterial intellect (mind) that exists outside the material causal organ of the brain but works cooperatively with it. In this way, we see why (a) the brain and its sensory appendages are the necessary, though not sufficient, instruments of conceptual thought and (b) the immaterial intellect is the sufficient cause of abstract thinking, though dependent on the instrumental cause of the brain's perceptual thought processes.

In sum, it is the spiritual intellect or mind substantially united to a material body or brain that defines the human animal as an intelligent, free person. Identifying human beings as creatures who have the unique capacity for rational intelligence and freedom requires us to explain the difference between humans and animals as an essential, not a superficial, one. Human intelligence differs specifically from animal intelligence in being an immaterial causative factor rather than a material organic power. Therefore, humans differ from all other animals not superficially, or by degree, but radically. And that radical, specific difference of *sapiens* raises the human being above, i.e., a being superior to, all other members of the animal kingdom.

Philosophical Roadblocks to Understanding fMRI Data

The proximate philosophical error preventing materialists like Leshner from giving an adequate account of the human person and human thought (including the mental act of intention that is central to the Haynes experiment) is the failure to explain the facts of abstraction, true language, and self-consciousness. To imply that observable neurological processes in the human brain could ever be the cause of a person's capacity for these immaterial capacities is to conflate an inferior cause (the human brain) with a superior effect (conceptual thought). But simple logic dictates that the perfection of effects can never exceed that of their cause. And a human person's capacity for conceptual thought, notably evident in all scientific and mathematical thinking, with its ability to transcend time and space—empirical evidence of an immaterial dimension in the human being—exceeds the perfection of the sensate, material nature of the human brain's perceptual processes, dependent as they are on particular, material objects of thought in the here and now.

Materialists make a more remote philosophical mistake in maintaining that the mind (and, by extension, human intention) are in the brain. It arises from their untenable position, often unstated, that the unique human capacity for propositional language with its requisite capacity for abstract thought represents only a superficial difference in kind between animals and humans.

Correcting the Philosophical Mistake¹⁶

Since linguistic conceptual thought and free choice exceed the essential perfection of the material human brain and its sensate appendages, the materialist argument for the superficial difference of humans does not stand. Neither, of course, does Leshner's analysis of the relationship between the brain scan data and the study participants' intentions. Only an immaterialist view of the human person and human thought—one that recognizes an immaterial power in the human being that radically separates human nature from animal nature—adequately explains what it means to be human and what it means to think conceptually. Reading brain scans for human intention identification within an immaterialist anthropology is our only hope of adequately informing those conducting the study, those participating in it, and those reading about it online and in print of the radically different ways they ought to think about and treat human beings and animals.

First, humans, with their immaterial powers of intellect and will, are moral beings or persons. The human being, though rooted in the natural world, sounds through (*personare*) his or her body, thereby transcending his materiality. Animals, in contrast, defined directly by their materiality and circumscribed by the temporal, spatial, and determinative constraints of their perceptual (sensate) knowledge and behavior, are objects, not subjects; things, not persons.

Second, human beings, by virtue of their immaterial intellect, are emancipated from the determinative forces of basic instinctual drives toward food, sex, and drink. As a relatively free agent, then, the human person has the capacity to choose whether to satisfy or to deny these instinctual goals—or even to renounce them for spiritual ends. More comprehensively, the human person has the power to understand that happiness is the ultimate goal of life. No empirical evidence evinces the capacity in animals to transcend instinctual goals. Inferentially, then, we also conclude that an animal could neither conceive nor freely pursue a metaphysical, ultimate goal.

Third, human beings, by virtue of their subjectivity, possess intrinsic dignity. As a subject, a human being is to be loved as an end in himself, never used as a mere means to someone else's end. Animals, as part of the objective world, are not ends in themselves, and can in certain circumstances be used as means to extrinsic human ends.

Fourth, human beings—embodied persons dignified by their freedom and intelligence—possess inherent rights, rights that are theirs by virtue of their human nature. As the subject of rights, every human being has the corresponding responsibility to exercise those rights justly, that is, in ways that consistently honor the rights of other persons. Human beings have the responsibility to use animals, plants, and inanimate things in humane and intelligent ways. Animals, in contrast, have no intrinsic rights and, therefore, exercise no responsibility. Current concern by environmentalists clearly demonstrate that human technological control, both in positive uses and negative abuses, over our environment essentially transcends animal uses of the environment.

Fifth, accidental differences of race, gender, religion, developmental maturity, and acquired abilities notwithstanding, one human being is essentially equal to every other and shares equally in basic human rights. Even though human beings may not always treat one another in accord with this equality, a basic ontological equality of all humans is generally acknowledged.

Conclusion

What hangs in the balance in securing a satisfactory meta-ethical understanding of the brain scan experiments for intention identification considered here is the formidable and ongoing task of shoring up the metaphysical principles grounding human rights, freedom, dignity and spirituality. It follows, then, that the importance of giving center stage to such analysis in the current public debate surrounding neural research cannot be overestimated.

Endnotes

- 1 "Revealing Secret Intentions in the Brain: Scientists decode concealed intentions from human brain activity." (www.mpg.de/english/illustrationsDocumentation/documentation/pressReleases)
- 2 John-Dylan Haynes et al, "Reading Hidden Intentions in the Human Brain," *Current Biology* 17 (2007): 323-328.
- 3 Unlike x-rays and CT scans, magnetic resonance imaging (MRI) does not depend on radiation. Instead, it utilizes radio waves that are directed at protons, the nuclei of hydrogen atoms, in a strong magnetic field. Radio waves are directed at the protons in the organ or body part being studied. When the protons change their position in the magnetic field, they set up signals that are detected by coils in the MRI unit. A computer processes these signals and generates, first, one-dimensional and then three-dimensional images of the part of the body being studied.
- 4 In a fMRI exam, like that used in the John-Dylan Hanes study, participants are given a function to perform while their brains are being scanned. In the Haynes study, participants were asked to decide whether to add or to subtract. The resultant brain scans showed that the mental states associated with the participants' intentions could be correlated—70 percent of the time—with a respective addition or subtraction "signature" or template of increased metabolic activity in the area of the medial and lateral prefrontal cortex of their brains. The increase of neural activity in this region of the brain, including expanding blood vessels, chemical changes and delivery of extra oxygen, were recorded on MRI images. Then a computer, first, processed these blood-oxygenation-level-dependent (BOLD) functional MRI signals and, second, generated a series of images, each of which showed a thin slice of the brain. The computer compiled these serial images into a 3-D representation of the targeted brain region which were then analyzed from different angles on a computer monitor. Thus, "functional magnetic resonance imaging (fMRI) is a relatively new procedure that uses MR imaging to measure the tiny metabolic changes that take place in an active part of the brain." (www.radiologyinfo.or/en)
- 5 Using fMRIs for forensic evidence in a criminal case or to determine probation status for someone already in prison dependent on whether he/she intends to recommit the crime again raises the issue of whether these brain scans, even if perfected to an acceptable level of reliability, would be valid evidence. Since Anglo-Saxon law decides a criminal case on the basis of evidence that proves, beyond a reasonable doubt, that the one accused has actually committed the crime, serious reservations about the appropriate forensic use of fMRIs are obvious. Does allowing fMRI as circumstantial or even hard evidence mean that we are willing to convict people on the basis of their intentions alone (the dangers of which—the creation of "thought police," e.g.—are the stuff of sci-fi films such as *The Minority Report*)? How, practically speaking, will we judge an accused person's intention to murder someone if the scan cannot be done until after the alleged intention/criminal act? How will a post-crime fMRI that somehow reveals that the person did intend to murder someone take into account the possibility that that

- person subsequently changed his mind and never carried out the intention? Currently, federal evidentiary rules prohibit all expert witnesses from testifying that a criminal defendant did or did not have the requisite intention to commit the crime (specifically, rule 704B: “No expert witness testifying with respect to the mental states of a commission or of a defendant in a criminal case may state that opinion or inference as to whether the defendant did nor did not have the mental state.”). This rule would need to be changed before a fMRI could be used as circumstantial evidence in federal and most state criminal courts in proving the innocence or guilt of the person accused.
- 6 The term “immaterialist” anthropology should not be understood to mean that the human person is somehow disembodied, or without matter. Immaterialist here stands for a theory of *anthropos* that adequately accounts for the human being by its understanding that the human body is inspirited and the human spirit is embodied. Thus, the human person is a unitary being composed of both material and immaterial dimensions or causative powers that are inextricably linked. My use of “immaterial” is equivalent to the traditional notion of “spiritual” but unfortunately today that term is also used very ambiguously.
 - 7 “It’s time to Go Public with Neuroethics,” *The American Journal of Bioethics* Vol. 5, No. 2 (2005): 1. Leshner is obviously using the term dualist rather loosely to refer to any view that defines the human person and human cognition as having both a material and a spiritual cause. Typically, overcoming dualism refers not to vindication of the notion that the human person is monolithically material, as Leshner seems to imply, but to the resolution of the failure of 17th century philosopher, René Descartes, to demonstrate exactly how body and soul are related, i.e., united within the individual person and a composite source of personal status and dignity. The commonsense approach of Aristotle and Thomas Aquinas demonstrates that the human person is a composite being whose soul or immaterial cause is substantially united to the body or material cause in such a way that the immaterial power informs the material body, making it an active whole with characteristic properties and performances, and thus defines the human being as a *rational* animal, specifically distinct from and superior to, all members of the animal kingdom.
 - 8 The headlines of popular accounts of the Haynes study (“The brain scan that can read people’s intentions,” “Brain scan ‘can read your mind,’”) demonstrate that, without a hint of critical filtering, the populist print outlets mindlessly repeat a materialist reading of the Haynes study. Unfortunately, when such popular accounts are no more than an unexamined reinforcement of an inadequate reading of a study’s conclusion, they not only fail to help their lay audience to properly critique the experiment but, more importantly, they fail to help readers to properly understand who they are: embodied persons who are rationally intelligent and free.
 - 9 Leshner, “It’s time,” p. 1.
 - 10 In this section I rely on Ashley’s immaterialist philosophy of the human person and human psychology set down in chapters four and five of his book, *Healing For Freedom: A Christian Perspective on Personhood and Psychotherapy* (to be published by the Institute for Psychological Sciences, Arlington, VA).
 - 11 For an excellent discussion of the formidable hurdles that would need to be overcome in order to untangle the complexities involved in the brain’s perceptual processes, refer to: “Decoding mental states from brain activity in humans,” *Nature Reviews: Neuroscience*, Vol. 7 (July 2006). Authors John-Dylan Haynes and Geraint Rees examine the long list of daunting technical and methodological challenges. First, since the neural base of the BOLD signal is not yet fully understood, we need to be cautious in interpreting the results of fMRI decoding. “Any information that can be decoded from fMRI signals might not reflect the information present in the spiking activity of neural populations.” Second, the steep cost and limited transportability of current fMRI scanners “impose severe restrictions on potential real-world applications.” Third, in all the human decoding studies done thus far, the decoding algorithm was “trained” for each participant individually and for a fixed number of mental states that were measured in a single recording session. The bewildering problem of developing decoding algorithms (brain activity templates) for real- world applications is that they must reflect “the invariant properties of a particular mental state” that “generalize over time, across subjects and to new situations” and across “different instances of the same mental state” with its infinite number of “contextual variations.” Fourth, there is the question of adequately addressing superposition,

where a person's immediate decision or mental states "coexists with simultaneously occurring changes in the current focus of attention." Somehow these simultaneously occurring mental states must be able to be separated before they can each be decoded. Fifth, the problem involved with the fact that, though "the number of possible perceptual or cognitive states is infinite," the "number of training categories is necessarily limited." And, until this problem is resolved, brain reading will be restricted to "simple cases with a fixed number of alternatives, for all of which training data are available." Sixth, since decoding of the brain is inversely inferential, "[e]ven if a specific neural response pattern co-occurs with a mental state under a specific laboratory context, the mental state and pattern might not be necessarily or causally connected. Just so when that response pattern is found in a real-world situation: the response pattern might not be "indicative of the mental state."

Considering the daunting nature of any one of the challenges just described, each complicated by the ever present possibility of an error of personal judgment on the part of those interpreting the brain scan, it is easy to see why some aver that neuroimaging techniques are not now and never will be reliable and unambiguous proofs for the existence of certain mental states within a person's brain. (Cf. Paul Root Wolpe, Kenneth R. Foster, and Daniel D. Langleben, "Response to Commentators on 'Emerging Neurotechnologies for Lie-Detection: Promises and Perils?'" *The American Journal of Bioethics*, 5[2] 2005: W5.)

- 12 We could do a similar hypothetical reconstruction of the less involved intention studied by Haynes, i.e., the decision to add or to subtract. The dynamic of the latter would still reveal the same kind of simultaneous activity between the primary and instrumental causes of the mind (intelligence and freedom) and brain, respectively.
- 13 Of course, we know that the eventuality that Mr. X or any other person with criminal intent would submit to a fMRI while he is deciding to perform a crime is simply risible. That reality raises the question of what neuroimaging specialists would be looking for if they would scan the brain of a person accused of a criminal act after the fact. Would the function assigned to the accused be to remember his criminal intent? Could the accused resist doing so, even if he had made a decision to commit the crime?
- 14 Neuroscientists who evaluate the results of fMRI studies for intention identification do describe the scanned information as that which infers the person's intention, almost as if they believe that the neurobiological substrate references some immaterial intention apart from the observed biological brain activity. But, if we held materialist neuroscientists to consistency with their position that the intention is in the brain, they would have to define the inferential nature of the biological brain substrate shown on the fMRI as referencing the biological intention produced by the brain! This reveals the basic reductionist error of their materialist interpretation of the content of brain scans for intention identification.
- 15 Ashley's distinction of the four distinct secondary senses—synthetic sense, memory, imagination, and evaluative sense—is based on empirical analysis of human and animal behavior just as is that of the primary senses of touch, smell, taste, sight and hearing.
- 16 In this section, I am relying on the conclusions of Mortimer Adler in *The Difference of Man and the Difference It Makes* (Bronx, NY: Fordham University Press, 1993), which I have summarized elsewhere (Cf. "Is It Ethical to Generate Human-Animal Chimeras?" *National Catholic Bioethics Quarterly*. Spring [2006]:109-130). Adler's arguments harmonize perfectly with those of Ashley and in a way that elegantly confirms our commonsense experience of who we are and how we think.

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