



Scientific Research on Intention

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Understanding *intention* – the expression of one’s purpose, desire, volition, or will, including common activities such as prayers and blessings – is important because voluntary action is fundamental to our sense of self and to our assumptions about the behavior of others. Intention has been studied by philosophers, theologians, and legal scholars for many years, but scientific interest is relatively new. In science, intention is being explored within five basic categories: neuroscience, medicine, psychology, physics, and engineering, with many cross-disciplinary overlaps. A sixth, exploratory domain, includes studies investigating the role of intention in direct mind-matter interactions.

Intention is related to but is not the same as *mind*, because intention is a mental property related to actions, whereas mind itself may be considered the “apparatus” that harbors or produces subjective mental states. Intention is also not the same as *consciousness*, which may be defined as the capacity of being aware. It is likewise distinct from *attention*, which is a mode of focusing or selecting objects of perception, thinking, or awareness.

Neurosciences

The study of intention within the neurosciences focuses on understanding the neuroanatomy (localized portions or “circuits” of the brain) responsible for the sense of free will, and the brain functions responsible for how we understand the intentions of others. Several brain

areas are known to correlate with intentional planning, such as the dorsal prefrontal cortex, which is implicated in the generation of plans for voluntary action.

In general, the neurosciences have determined that our sense of free will appears not to be determined in real time by a disembodied “self,” but rather it depends on many other factors, mostly unconscious, some taking place before and some after actions associated with intentions. Many neuroscientists today assume that the brain is, in essence, an exceedingly complex, deterministic computer, and as such, concepts like mind, self, intention, volition and free will are regarded as illusions. The illusions are compelling, but nevertheless the concept of a separate mind that decides how it wishes to act, independent of the brain, is viewed as subjectively reasonable but objectively incorrect. Studies of pathological forms of intention are often used to support this view. For example, in schizophrenia or obsessive-compulsive disorders, one may feel compelled to act even against one’s conscious wishes. The same is true for non-pathological phenomena such as hypnosis, automatic writing, Ouija board movements, dowsing, or trance channeling. In such cases highly complex intentions and actions can occur without conscious will, and sometimes, against conscious will.

Studies investigating slow cortical signals in the brain (“readiness” waves) also support the idea that the source of intention is unconscious brain activity, because through such measurements one’s apparently free choices can be observed to be determined unconsciously a fraction of a second before the decision becomes conscious. Once recognized, conscious will can apparently override those choices, but the original intentions are not freely selected.

Research in this domain is advancing rapidly because of increasingly higher resolution brain imaging tools, more sophisticated analytical

procedures, and because of the discovery of a new classes of neurons in the brain called “mirror neurons.” These neurons appear to be central to our ability to understand the intentions of others because they activate while we are observing the actions of others. Mirror neurons also provide a neurological basis for empathy and the phenomenon of “emotional contagion,” in which, for example, watching another person cry can cause tears to well up in the observer. (See <http://tinyurl.com/5a2trl>).

There is increasing interest within military and intelligence circles on means of detecting intention through noninvasive, remote means. Existing methods, based on functional MRI technologies, are elementary, but the potential exists for much more sophisticated methods of detecting and “decoding” intentions, possibly in surreptitious ways. Such technologies would be useful in say, airports, to detect the hidden intentions of passengers. But there are also growing concerns about the increasing invasion of privacy through use of such technologies. (See <http://tinyurl.com/5hkaag>).

Laboratories studying the neuroscience of intention can be found in many major neuroscience universities worldwide. For example, David M. Eagleman at the University of Texas, Houston Medical School, has been studying both where and when in the brain the feeling of intention arises. John-Dylan Haynes and his colleagues at the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, Germany, have shown that it is possible to “decode” which of two tasks individuals were secretly intending to perform by monitoring brain activity in the medial and lateral regions of the prefrontal cortex. And Giacomo Rizzolatti and colleagues at the University of Parma, Italy, has been studying the role of “mirror” neurons in the brain and they facilitate our understanding of others’ intentions. Dozens of scientific and scholarly journals regularly publish articles reporting experiments on intention, from *Science* and *Nature*, to *Behavioral and Brain*

Sciences, Consciousness and Cognition, Clinical Neurophysiology, and Progress in Brain Research.

Psychology

In the psychological and social sciences, interest in intention tends to focus on ways of influencing apparently free choices through implicit or subliminal means, and on the moral consequences of believing or not believing in free will. For example, social psychologists Vohs and Schooler conducted a study showing that moral behavior is associated with one's belief in free will. Students primed with text that portrayed behavior as pre-determined by the brain were more likely to cheat on a computer-based test than those primed with text that endorsed free will. This indicates that the way that we think about intention, and by association who and what we think we are (mindless zombies vs. free-willed selves), has strong consequences on the way that we act. (See <http://tinyurl.com/5udv69>).

Medicine

In medical research, intentions are being studied to see why “good intentions,” such as maintaining a healthy diet, or choosing healthy vs. unhealthy snacks, are often so difficult to sustain. Intention is also closely associated with expectations and the placebo effect, which accounts for a very large percentage of healing outcomes. A search on the NIH's *PubMed* website, a major online bibliography of health-related scientific work, returns over 2,000 citations on the topic “intention and placebo” alone.

Brain-activated technologies

A rapidly growing area of research, associated with the neurosciences but with a special focus on applications, involves deciphering intentions through analysis of brain electrical and hemodynamic activity. Most contemporary research focuses on use of EEG and fMRI techniques, which

require direct contact with or close proximity to the skull. But there is substantial interest within the Department of Defense in detecting intentions at a distance, using new types of brain scanners under development that do not require contact. Such devices work by learning patterns or “signatures” of brain activity corresponding to different thoughts and intentions. They scan the brain to look for these signatures, which allows the devices to know what the person is thinking, or in some cases predict what the person is about to think but is not even aware of yet. The promise of these technologies are applications such as intentional control of artificial limbs, robots that respond to thoughts, new means of interrogating criminals, and identifying people who intend to commit crimes.

Scientific journals regularly publishing advances in this area include *Nature Reviews Neuroscience*, *Neuroimaging*, *Journal of Neuroscience Methods*, and *Human Factors*. Major university centers around the world are working on these technologies, including MIT, Stanford, University of California at Irvine, Albany Medical College, Washington University School of Medicine, Berlin Institute of Technology, and George Mason University. (See <http://tinyurl.com/643jvv> and <http://tinyurl.com/5fzcpj>).

Physics

Within modern physics, questions about intention, volition and consciousness arise because of the still unresolved role of observation and measurement in quantum theory. It may seem strange that such a fundamental question has yet to be adequately resolved, but the measurement problem remains an important puzzle. It is relevant to understanding intention because stated in another way, the measurement problem asks, How is mind related to matter? From the perspective of the neurosciences, there is no independent mind (or intention, or free will) and

so the answer to this question seems clear. But from the perspective of basic physics, the issue is more complicated.

As physicist Henry Stapp puts it, “This ancient question in philosophy is rapidly becoming a core problem in science, perhaps the most important of all because it probes the essential nature of man himself. The origin of the problem is a conflict between the mechanical conception of human beings that arises from the precepts of classical physical theory and the very different idea that arises from our intuition: the former reduces each of us to an automaton, while the latter allows our thoughts to guide our actions. The dominant contemporary approaches to the problem attempt to resolve this conflict by clinging to the classical concepts, and trying to explain away our misleading intuition. But a detailed argument given here shows why, in a scientific approach to this problem, it is necessary to use the more basic principles of quantum physics, which bring the observer into the dynamics, rather than to accept classical precepts that are profoundly incorrect precisely at the crucial point of the role of human consciousness in the dynamics of human brains.” (See <http://arxiv.org/abs/quant-ph/9905054>.)

Direct mind-matter interaction

In the popular mind, the concept of direct mind-matter interaction is associated with movies and books like *What the Bleep do we Know*, *The Secret*, *The Power of Positive Thinking*, *The Power of Intention*, or with spooky claims about psychokinesis within the esoteric, occult or paranormal lore, or with large-scale experiments seeking to show the effects of mass collective intentions on the world (see

<http://www.theintentionexperiment.com/> and
<http://noosphere.princeton.edu.>)

Because of the entertainment-oriented spin in which this topic is often portrayed, most scientists have studiously avoided it. However, while the topic is controversial, there is growing evidence suggesting that intention can indeed directly influence how the physical world manifests. This evidence challenges prevailing neuroscience assumptions because it suggests that the mind may not be identical to the brain, as there are no known ways that the brain (viewed in classical physical terms) could influence anything at a distance, other than through extremely weak magnetic or electromagnetic interactions.

Possible effects of direct intention have been studied in the context of the role of intercessory prayer in distant healing. Another class of studies has focused on the role of intention in affecting a distant person's physiological state, a third is the effect of intention on other living systems such as animals, cells, and bacteria, and a fourth involves a range of nonliving physical systems. The cumulative experimental evidence in all four areas is positive.

Prayer

Prayer is the most commonly used "alternative medicine," according to a survey of more than 31,000 adult Americans. It is more popular than acupuncture, chiropractic care, yoga, vitamins and other complementary medical therapies. The survey was conducted as part of the Centers for Disease Control and Prevention's 2002 National Health Interview Survey. The survey showed that 52% of adult Americans prayed for their own health and that 31% had asked others to pray for their health.

The interesting question from a scientific perspective is whether prayer, viewed as a type of intention, works at a distance. Clinical experiments

testing this question have been conducted for several decades, and a growing number of meta-analyses of those experiments have been published. Not surprisingly, because science regards religious concepts as superstition, and because many religions reject the idea of “testing” God, the idea that the claims of distant prayer can in fact be tested, and that it may actually have positive, measurable effects, is regarded as extremely controversial.

As such, despite the best efforts of reviewers, some meta-analyses have concluded that there are no health effects associated with prayer and thus no further studies are warranted, while others have reached exactly the opposite conclusion. A PubMed search on “intercessory prayer” finds 74 articles, one published in 1988, 12 in the 1990s, and 61 published since 2000. As a new and contentious topic of medical research, the lack of no firm consensus to date is to be expected. However, in light of the limited number of clinical trials conducted, some with clearly positive and others with negative outcomes, it may seem surprising – especially given the widespread use of prayer – that some reviewers are already confidently recommending that no further research be conducted. Such confidence is undoubtedly driven by scientific or theological prejudices, rather than a neutral consideration of the evidence.

Information on distant healing, including practices, articles, video interviews, and scientific research, can be found at the Institute of Noetic Sciences website, here: <http://www.ions.org/research/dh/main.html>. A bibliography listing published scientific studies ranging from clinical trials on the healing effects of intercessory prayer to experiments testing the effects of intention on a wide range of living systems (animals, bacteria, plants), can be found here:

http://www.ions.org/research/dh/biblio/DH_Bibliography.pdf

Distant Mental Interactions with Living Systems (DMILS)

Results of medical experiments on prayer will probably remain hotly contested for the foreseeable future because of the religious connotations of prayer, but conceptually related experiments have been conducted in a purely secular context, and do not involve healing. This line of research, known generically as “distant mental interactions with living systems,” or DMILS, examines the effects of one person’s intentions on a distant person’s physiological status. A recent meta-analysis of 51 such studies concluded: “There is a small, but significant effect. This result corresponds to the recent findings of studies on distant healing and the ‘feeling of being stared at’. Therefore, the existence of some anomaly related to distant intentions cannot be ruled out.” (Schmidt, Schneider, Utts & Walach, 2004, Distant intentionality and the feeling of being stared at: Two meta-analyses. *British Journal of Psychology*, 95, 235–247).

A dozen conceptually related studies have investigated correlations arising between pairs of isolated people, one of whom is exposed to a stimulus (like a light flash) under randomized, counterbalanced conditions, and another person at a distance whose physiological condition is measured via changes in skin conductance, blood pressure, heart rate, or brain electrical or blood oxygenation levels. Outcomes of those studies show positive correlations consistent with the results of the distant intention experiments.

Mind-Matter Interactions in Physical Systems

Hundreds of other published experiments, investigating the effects of intention on nonliving systems, ranging from various properties of water, to the movement of dropped plastic balls or machine-tossed dice, to streams of random bits generated by electronic circuits and Geiger counters, provide

further support for the idea that intention directly interacts with aspects of the physical world. (See <http://www.princeton.edu/~pear/>).

Mind-matter interaction studies are regarded as controversial not so much because of the evidence, which cumulatively shows consistent, positive patterns across a wide range of experiments, but rather because the phenomena do not easily fit within prevailing theoretical assumptions about the mind-brain and mind-matter relationships. As a result, direct effects of intention are regarded as anomalous at best, and impossible at worst. And like most anomalies, they tend to be ignored or viewed with suspicion.

Despite the disquiet that these phenomena evoke, increasingly sophisticated experiments continue to show positive results, so it seems likely that as science continues to advance new theoretical models will arise that will eventually accommodate these phenomena. Rather than radically overturning science as we presently know it, the new models will simply be an evolutionary expansion of our understanding of the universe. They will reveal how existing theories are merely special cases of a more comprehensive view of reality. This is how all new discoveries in science have progressed in the past, from the kneejerk reaction of "it's impossible," to an eventual acceptance of the phenomenon as obvious. An extensive discussion of the evidence for direct mind-matter interactions and fledgling theories to help explain them may be found in the book, *Entangled Minds* (Simon & Schuster, 2006).