

Collective Consciousness and Our Sense of Interconnectedness

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Consciousness is defined as 1) the state or quality of awareness; 2) of being aware of an external object or something within oneself; 3) or having a sense of selfhood. Materialists would claim that our consciousness is limited to our physical brain. However, there is some preliminary evidence that mental attention can influence physical systems in an instantaneous and non-local way. The evidence is seen as micro-psychokinesis or the observation through statistical means of minute influences on inanimate probabilistic systems. Random number generators (RNGs) are one tool used to evaluate micro-psychokinesis or our ability to affect the physical world with our consciousness. The Global Consciousness Project (GCP) is an international collaboration of researchers around the world and is the longest running experiment in the micro-psychokinesis field using RNG's. Since the Global Consciousness Project's completion, new studies and tools have been developed to evaluate collective consciousness. Such experiments include those conducted from 2012 through 2016 at the Burning Man festival in Nevada's Black Rock Desert where the subjective experience is variously described as an "energetic shift" or as "electricity in the air" potentially evoked when tens of thousands of people coherently focus on the same event. The implications of these micro-psychokinesis results are that we are not in fact completely separate from our environment but have influence on it. Regardless of any definitive evidence of consciousness' effect on the physical world, an increased subjective sense of interconnectedness is noted to support positive psychological states nurturing our relationships with ourselves and others. In a world filled with separation, divisiveness, prejudice and war, humanity would benefit from endorsing a worldview of interconnection. In the meantime, we can continue our scientific efforts to evaluate consciousness' role in the physical world and characterize the relationship.

Keywords

Micro-psychokinesis, Psychokinesis, Consciousness, Interconnectedness, Random number generator, Quantum number generator.

Introduction

Consciousness is defined as 1) the state or quality of awareness; 2) of being aware of an external object or something within oneself; 3) or having a sense of selfhood. Materialists would claim that our consciousness is generated by our physical brain. However, there is some evidence, anecdotal and experimental, that this is not so and that our consciousness goes far beyond the limitations of the brain and can affect the physical world. A technical term for consciousness affecting the physical world is psychokinesis or PK. There are three general categories of PK [1]. Macro-PK refers to consciousness effect on the physical world that we can observe with our five senses. Bio-PK refers to consciousness' effect on

biological systems and includes the Direct Mental Influence on Living Systems paradigm [2]. Micro-PK on the other hand refers to consciousness' effect on "inanimate, probabilistic systems, producing effects that can only be detected through statistical means" [1]. The targets of these micro-PK systems can include tumbling dice, coin tossing systems, and hardware random number generators (RNG's). This paper will focus on reviewing bio-PK and micro-PK.

William Braud pioneered the most commonly used paradigm that demonstrates bio-PK called DMILS, or distant mental interactions among living systems, in 1977. In this paradigm, pairs of people are studied. One person, the "sender," is placed in a booth with a live-stream, closed-circuit video screen that periodically shows the other person, the "receiver." When the receiver's image appears, the sender sends as much energy, compassion, intention, or attention

as they can towards the receiver. Meanwhile, the “receiver” is sitting in a 2000 lb. electromagnetically shielded room and asked to simply relax and be open. While this sending and receiving occurs, the participant’s physiology is being simultaneously measured. One can then examine the physiology when the sender is sending versus not sending. Numerous laboratories have found that the receiver’s physiology changes when the sender is sending vs. not sending in this DMILS paradigm in dozens of experiments under different conditions. Most DMILS protocols were conducted with electro dermal activity (EDA) although a variety of other measures demonstrated similar results: blood volume pulse, brain blood oxygenation (fMRI) [3,4], electroencephalography (EEG) [4], and heart rate. To date, three meta-analyses have been conducted on the DMILS paradigm [5-7]. In 62 studies with over 3000 participants, the effect sizes were small but similar ($d = 0.106-0.128$). The overall suggestions of these studies are that: 1) the sender can affect the receiver at a distance, 2) the connection does not require any physical contact between the pair of people, and 3) the connection appears to be instantaneous. While the mechanism of action is still not clear, there is growing evidence for distant intentionality of an individual’s consciousness on a biological system.

A more health-oriented application of bio-PK is studies that evaluate consciousness’ effect on living systems with the directed intention for health and healing. Roe and team recently conducted two rigorous meta-analyses of distant healing including only randomized controlled trials where healing was an objective [8]. They reviewed English studies that examined the effect of positive intention on a biological system. They included 49 non-whole human studies and 57 whole human studies. The non-whole human studies had a combined effect size of 0.26 although when only the 22 higher quality studies were included the effect size was 0.115. The whole-human studies had a combined effect size of 0.203 and when the 17 higher quality studies were included the effect size increased to 0.224. While these effects sizes correspond to weak to moderate effects, the results are still remarkable considering that we would expect the effect of non-contact healing to be 0. Rao and colleagues conducted a systematic review of 27 studies with 3159 participants focusing more on modalities and pathologies [9]. Of those 27 studies, 13 had statistically significant positive findings. Populations that saw improvements included adults with cancer, chronic pain, chronic illnesses, and arthritis. These meta-analyses offer promising evidence for continued research into consciousness’ influence on biological symptoms and health and healing.

Micro psychokinesis or micro-PK is another widely evaluated phenomenon. Micro-PK refers to a paradigm with three aspects: a target, a participant, and an experimenter. The target is a probabilistic system such as random number generators or tumbling coins or dice, with a finite set of possible outcomes and known theoretical probabilities, such as the equal chance of heads or tails in a coin toss. A participant is asked to direct their intention on the target for a certain outcome. An experimenter, who

formulates hypotheses, defines experimental protocols, recruits the volunteers, conducts the experimental sessions and analyzes the data with statistical tools [1]. Sir Francis Bacon first suggested the use of dice as targets for intention experiments in 1670 in his *Sylva Sylva* or *A Natural History in Ten Centuries*. He shares that one could evaluate the “force of imagination” on inanimate objects like Dice or the shuffling of cards [10]. Fast forward 300 years later to JB Rhine who conducted numerous dice studies. Meta-analyses conducted on 148 dice experiments conducted from 1935-1987 with 31 control studies, 2569 participants and 2,592,817 die casts, reveal an intention effect ($z = 19.68$). However, when more stringent criteria are used for included studies, the z -score is reduced to 13 for homogeneity experimenters, $z = 5$ when removing statistical outliers, $z = 7$ for only balanced protocols, and $z = 2.6$ when including all of the stringent criteria [11].

The first micro-PK random number generators offered another practical target for consciousness’ influence on inanimate, probabilistic systems, producing effects that can only be detected through statistical means. Beloff and Evans were the first to use radioactive decay as a truly random source to be influenced in 1961 [12]. They used strontium-90 and observed its radioactive decay with a Geiger counter. Because decay occurs at random intervals, the counter is equally likely to stop in either state (particle decay or no particle decay). In this way, the radio decay was like a coin toss. Participants in these studies were asked to mentally slow down or speed up the rate of decay of a radioactive source.

Random number generators then moved from radioactive sources of randomness to electronic sources. The RNGs used in such studies are designed to do three things: (1) generate maximum entropy in the form of streams of truly random bits, (2) have their bit streams pass well-accepted statistical tests for randomness, and (3) rigorously exclude environmental influences such as fluctuations in electromagnetic fields, ambient temperature, humidity, vibration, etc. Ideally, the RNG’s are stable in their randomness. The electronic RNG’s use quantum processes to generate a stream of 0’s and 1’s at a rate of about 800 bits per second. According to what we know from physics, this data stream should always be random and not deviate from that.

In the 1970’s, Helmut Schmidt developed a binary protocol for these random number generators. In the protocol were two RNG’s. One was set up to give feedback to participants while the other was not. The participant initiated the trial by choosing one of two buttons (corresponding to 0 or 1). They then immediately received feedback on whether they chose the correct state of the RNG in that moment. Even though both RNGs’ output was completely random, the participant’s choice was significantly aligned with the feedback RNG ($z = 5.2$) [13]. Schmidt also examined precoded binary sequences that remained unobserved until they were used in a series of experimental PK runs. When combining five of these retroactive PK experiments with different experimenters, the results show positive evidence for micro-PK ($z = 3.67$) [1].

The Princeton Engineering Anomalies Research (PEAR) Laboratory at Princeton University published a paper in 2007 reporting on 12 years of psychokinetic research with RNGs. The analysis included 12 years of data with 91 participants and 2.5 million trials and produced highly significant results ($z = 3.8$) demonstrating a psychokinetic effect [14]. Another group at the Institut für Grenzgebiete der Psychologie und Psychohygiene in Freiburg in collaboration with the PEAR aimed to replicate these findings in another large study. Data was collected over three years and included 750,000 trials per condition (experimental/control) and 227 participants. This study did not replicate the same findings of a positive psychokinetic effect for their primary hypothesis ($z = 0.6$). There were two outlier participants in the PEAR database which resulted in incorrect power calculations for the replication study. Thus, some suggest that the failed replication was “not the result of elusive micro-PK but simply as due to an under-powered study.” [1]. Despite the non-significant result of the primary hypothesis of the replication, six pre-planned secondary hypotheses were significant. Furthermore, when the data of the original PEAR dataset are combined with the replication data, they produce a z score of 3.2 which is still a highly significant effect. Furthermore, regardless of the results of the primary hypothesis of the replication, the positive results of the original PEAR analysis are still valid.

Another interesting aspect to these RNG studies is that the intention effect was not dependent on time or space. For example, remote-participant data was collected over the course of a 6-year period [15] and involved participants from all over the globe, with remote locations ranging from 1 to 9,000 miles from the PEAR Laboratory. “No dependence of effect size on distance was found and results were essentially similar to those obtained with the usual protocol, in which the participant was seated in front of the RNG.” [1]. There was a subsample of the study where there was a temporal displacement (i.e. the participant was directing their intention to the system at a different time). Similar to distance, there was no correlation between time and effort and results were the same as the benchmark experiment. Thus, these results imply that the intention effect similar to what was seen in the DMILS paradigm is not dependent on time or space.

Meta-analyses examining laboratory RNG experiments in 372 publications from 1959 – 2006, from approximately 90 principal investigators and 20 laboratories, reveal a small but highly significant effect [16,17]. However, there is fairly good evidence from these meta-analyses that there is publication bias that should be taken into account when evaluating the laboratory micro-PK literature [1].

Other aspects that have arisen through micro-PK research are goal-oriented effects, decline effects, and participant characteristics. The mechanism for how psychokinesis works is unknown. Some imagine a force being emitted from the participant to influence the RNG. However, the lack of correlation between time and distance and the intention effect does not support this mechanism. There is

also evidence that the results demonstrate a goal-oriented rather than a force-like effect. Goal-oriented effect refers to the concept that the results are dependent on the feedback to the participant (i.e. the goal of the experiment from their perspective) regardless of the mechanistic steps it takes for the final outcome. “The finding that the success rate is rather independent of the physical structure of the generator...suggests that goal orientation may be a feature of the underlying mechanism rather than a matter of mere psychological attitude. It appears as if the subject, by concentrating on the final outcome, could induce nature to let the previous random events properly fall into place such as to lead to the desired outcome” (Schmidt, 1987, p. 109 as cited in M. Varvoglis & Bancel, 2015). The decline effect is observed in parapsychology when participants first start the experiment with excitement and energy and exhibit strong scores. As the experiment progresses and fatigue increases, they do not score as well which in turn decreases their motivation. The decline effect can be observed over the course of a single experiment or over a series of experiments. Decline effects can be avoided by conducting short sessions and/or stopping the session when the participant is bored or fatigued [18]. The most effective operator or participant is motivated, relaxed and focused (as is seen in meditation practitioners and in fact those with meditation experience in general do better on these tasks because of their ability to sustain their attention while staying relaxed) [1].

Another large body of evidence exists for psychokinesis that are not conducted in the laboratory through explicit psychokinesis as we have just described, but aim to measure large groups of people as the operator through implicit psychokinesis. Implicit psychokinesis refers to psychokinesis that occurs with no explicit effort or intention, no concurrent feedback, and no experimenter focus and is measured through RNGs in the field. The main question of this body of research is “Does an integrated, resonant group of people create an environment in which normally random sequences take on persistent biases?” Analyses after 61 studies (21 formal, 40 exploratory) strongly confirm the general hypothesis $p = 2.2 \times 10^{-6}$ vs. 0.91 for the control [19,20].

Field RNG studies like these supported a larger effort spearheaded by Roger Nelson of the PEAR laboratory to establish a network of RNGs around the world. This network of RNGs, called the Global Consciousness Project, was designed to evaluate the effect of collective consciousness. The general hypothesis was that “Periods of collective emotional or attentional behavior in widely distributed populations (global events) would correspond with periods of synchronized correlations in a global network of RNG’s.” The Global Consciousness Project or GCP consists of hardware RNG’s on computers around the globe mostly in Europe and North America called nodes with approximately 50-60 nodes in operation globally at any one time. The node computers collect the data and then upload the data to the server in Princeton, NJ, USA. The data is permanently archived and consists of over 30 billion time-stamped trials. While the RNG’s are still currently collecting data, the formal experiment for this project was conducted on 17 years of data. The process to record an event for

the project proceeded as follows: 1. Globally significant event identified; 2. Time period determined, variance statistic defined; 3. Formal event entered into hypothesis and prediction registry; 4. Data unpacked from archive; test statistic calculated; 5. Deviation of test statistic from expectation converted to equivalent normal z -score; and 6. Experiment aims to determine whether composite of ALL event z -scores differs from null (i.e. not individual events) [21]. The events studied included predictable events of mass interest like New Year's celebrations, meditations, sports events, political events and unpredictable events of mass interest such as Earthquakes, terrorist attacks, and celebrity deaths [22]. The types of events included emotional tones of suddenness or surprise (terror attacks, especially with global attention), fear and compassion (large natural disasters, typhoons, tsunamis, earthquakes), love and sharing (celebrations and ceremonies like New Years, religious gatherings), power interest (political and social events like elections, protests, demonstrations) and deliberate focus (organized meetings and meditations). Examples of evaluated events include the Indonesian Earthquake of May 27, 2006, Billion Person Meditation, Climate and Peace Activism, Sept 21 2014; Women's March on Washington, 2017 & 2018; and International Day of Peace, 2011. Overall, the GCP's formal results of 500 included events from August 1998 to December 2015 are highly significant ($z = 7.31$). The general implications of the results are that there were non-zero correlations between widely separated RNGs during "global events;" large, global scale events had larger effects than small, local events; for small events, RNGs close to the event had stronger effects than those further away; for large events, events when people were awake had stronger effects than when people were asleep; the time for an effect to develop was approximately 30 minutes and lasted approximately 2-3 hours; and that high emotion events had stronger effects than low emotion events although negative and positive emotion events were equivalent [23]. Some have suggested alternative models of explanation for these effects than the influence of collective consciousness, namely: goal-oriented effects of the investigator, methodological errors or leaks which bias the formal replications; conventional perturbations of RNG output due to ambient electromagnetic fields; a fortuitous selection of events and parameters through experimenter intuition and retroactive information [24,25] although further testing is required to evaluate whether these are valid.

Next Generation RNGs

Since the Global Consciousness Project's completion, new studies and tools have been developed to evaluate collective consciousness. Such experiments include those conducted by researchers from the Institute of Noetic Sciences (IONS) from 2012 through 2016 at the Burning Man festival in Nevada's Black Rock Desert. Participants of Burning Man describe the experience variously as an "energetic shift" or as "electricity in the air" potentially evoked when tens of thousands of people coherently focus on the same event during the festival, namely the burning of a large man effigy on Saturday night and a temple at the end of the festival. The full report of these exploratory studies are available here <https://library.noetic.org/library/video-interviews/collective-consciousness-burning-man-overview-research>.

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At the 2012 Burning Man festival, the IONS team used a Psyleron RNG device. Its output was recorded on a laptop PC located in a recreational vehicle parked at the festival, about a half-mile from the burning man effigy. Gaps in data collection occasionally occurred due to power interruptions while the PC laptop's battery was recharged by the RV's electrical generator. To see if the outcome of the 2012 experiment might have been due to an idiosyncratic quirk of the Psyleron RNG, the IONS team returned in 2013 and simultaneously collected data from six RNGs. One was a Psyleron; two were based on a similar device from an independent manufacturer (the Orion, Amsterdam, The Netherlands); two were based on latencies between emissions of alpha particles from a source of Thorium-232 (RM-60 Geiger Counter, Aware Electronics, Wilmington, DE), and the sixth was based on the behavior of photons passing through or bouncing off a half-silvered mirror (Quantis, ID Quantique, Switzerland). The Psyleron, Orion and Quantis RNGs used xor logic on the output to decouple the generator from environmental influences. Z -scores for the Geiger Counter-based RNGs were based on normalized counts of ionizing radiation detected per second. What was clear from the 2012 and 2013 experiments was that the source of randomness in the RNG was not a critical factor (i.e. the results were the same for the different devices). However, any attempt to determine *why* the observed deviations occurred was obscured by use of the RNGs' xor logic. To avoid this problem, the 2014 experiment included a new kind of RNG designed to record the random noise prior to its being converted into bits. The device used electron-tunneling noise generated by a Zener diode as the source of randomness, which is the same type of semiconductor component used in the Psyleron and Orion RNGs. The analog noise produced by the diode was amplified, digitized and stored at 44.1K Hz. This new electronic circuit was called a Quantum Noise Generator (QNG). The 2014 experiment was only able to capture viable data for the temple burn and there was no significant finding. The revisions for the 2015 experiment included the use of solar panels to help charge the batteries and reduction of the noise sampling rate from 44.1K Hz to 32K Hz to reduce the required memory storage. In 2016, the QNG was redesigned to help ensure that continuous data could be recorded over the entire festival. The QNGs were placed inside an RV instead of attempting to place the devices out on the desert floor. Previous attempts using outdoor QNGs informed us that the desert environment is too harsh and unpredictable to reliably gain continuous data. In addition, we further miniaturized the QNGs and the sample rate was reduced to about 1K Hz. A total of 30 channels of data were successfully collected continuously for 8 days, running on a battery. Table 1 summarizes the results of the five studies. Eight of 9 analyses produced positive results, three were independently statistically significant (two-tail), and when all results were combined the field consciousness hypothesis was supported for both the Man Burn ($z = 3.25, p = 0.001$) and the Temple Burn ($z = 3.21, p = 0.001$) in these exploratory studies. However, these results are only suggestive rather than definitive

because the analytical methods across the different experiments varied and were not strictly pre-planned. While there are variations in equipment used, time-scales for peak correlation, amounts of data and analyses methods, these exploratory studies support the concept of collective consciousness influencing the physical world and the need for further research in this area.

Table 1: Burning Man Festival Results 2012-2016.

Experiment	Window	z(Man)	z(Temple)
2012	1 hour	2.748	0.396
2013	1 hour	1.799	2.512
2014	20 min		1.341
2015	3 hours	1.136	-0.215
2016	1 hour	0.823	3.148

These results, especially when viewed in light of previous field consciousness experiments, suggest that collective coherence effects may be observed with different sources of randomness, including random bits conditioned through XOR logic and pure electronic noise. This suggests that the underlying effect of collective consciousness may be better modeled as a “negentropic field” of or characterized by a reduction in entropy (and corresponding increase in order) or coherence principle rather than any sort of conventional force-field. To further explore this idea, future experiments might wish to focus on the detection of coherence or generation of order in physical systems beyond RNGs and QNGs. One could predict, for example that during periods of intense mental coherence one might observe, say, improved battery efficiency, more efficient chemical reactions, more robust seed growth, and so on. In each case, regardless of the target system one could predict it to shift in a direction associated with greater coherence, however such coherence might manifest in that particular system.

Consciousness Effect on Social Outcomes

Not only have consciousness effects been measured with DMILS paradigms, distant intention paradigms, RNGs and QNGs, but also through changes in social outcomes through a series of meditation studies evaluating the Maharishi effect. Maharishi Mahesh Yogi predicted in 1960 that one percent of a population practicing Transcendental Meditation would create measurable improvements in the quality of life for the whole population. Various studies have attempted to evaluate this by having large groups of meditators stationed in particular areas and then measuring various social health outcomes. Twenty peer-reviewed studies suggest that creating coherence in collective consciousness can result in improvements in the quality of life in society, increased governmental success and international cooperation without the use of armed forces through focused meditation events. These studies observed reductions in hostile acts, verbal hostility, and cooperative acts in trouble-spot areas around the world such as a reduction in violent crime in Washington, D.C , decreased trends of homicide and urban violent crime in various cities in the USA, and reduced violence in war torn areas where groups were meditating with intention [26].

Our Sense of Interconnectedness

The general implications of these psychokinesis studies are that we are not in fact completely separate from our environment but have an influence on it. The results support the hypothesis that we are actually interconnected. According to Big Bang theory, this would make sense because at that point everything was connected [27]. Quantum entanglement has demonstrated this interconnection theoretically and also experimentally. There have been experimental demonstrations of entanglement confirmed with small objects like photons, neutrinos, electrons, and even larger objects such as molecules the size of Bucky balls and small diamonds [28]. In a recent Massachusetts Institute of Technology experiment, quantum entanglement was demonstrated with light from distant, ancient quasars, which are luminous, energetic galactic nuclei that was emitted 7.8 billion years ago and 12.2 billion years ago [29].

Quantum entanglement is one way we can observe interconnectedness. We can also subjectively experience interconnectedness as described in many traditions with different names such as Samadhi, Nonduality, pure consciousness, nondual awareness, and oneness. In a systematic review of these transcendent states in meditators, the interconnected experience was described very similarly across contemplative traditions. Namely, a state of awareness free from content that is absorptive, unitive, undifferentiated, adaptive, in harmony with reality, and accompanied by feelings of joy and/or bliss [30]. The state is also ineffable, which precludes describing it adequately with words.

The subjective sense of interconnectedness, social and otherwise, provides more than simply the context through which we can understand an individual’s behavior. Indeed, it is a capacity that can be internalized as part of a person’s social identity. Individuals with a sense of meaning, purpose, and belonging often experience positive psychological states, which result from embracing a social environment comprised of others such as larger communities and families [31]. In an ongoing study (www.noetic.org/IDL), the IONS team has been evaluating participants’ sense of interconnectedness before and after transformational practices to better understand what is meant by “interconnected” and in so doing, better understand how to regularly access this feeling to create beneficial impacts for ourselves, each other, and the planet. As an exploratory preliminary analysis in this ongoing study, we evaluated the relationship between participants’ subjective sense of interconnectedness and their level of compassion for themselves and others and found a positive relationship ($n = 938$; $r = 0.33$, $p < 0.000005$).

In conclusion, there is growing positive evidence that our consciousness does affect the physical world at a minimum at the micro-psychokinesis level. We can evaluate this effect of our intention through RNGs and new systems like QNGs. Physics through experimental demonstrations of quantum entanglement on the micro- and macro-scale support the concept of interconnectedness. The implications of our influence on the

physical world are far-reaching considering the dominant paradigm in Western culture is that we are all separate and our consciousness does not extend beyond our physical brain. Regardless of any definitive evidence of consciousness' effect on the physical world, an increased subjective sense of interconnectedness is noted to support positive psychological states nurturing our relationships with ourselves and others. In a world filled with separation, divisiveness, prejudice and war, humanity would benefit from endorsing a worldview of interconnection. What if we imagined our intentions and thoughts influence the physical world? Would that change our behavior towards increased loving-kindness and compassion to ourselves and others? If so, then surely the exercise would be worth the effort without waiting for definitive scientific evidence that it is so. In the meantime, we can continue our scientific efforts to evaluate consciousness' role in the physical world and characterize the relationship.

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