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RESEARCH ARTICLE

Mind Control of a Distant Electronic Device: A Proof-of-Concept Pre-Registered Study

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Abstract—This study was aimed at verifying the possibility of mentally influencing from a distance an electronic device based on a True Random Number Generator (TRNG). Thirteen adult participants contributed to 100 trials, each comprised three samples of data each of 15 minutes' duration: one for pre-mental interaction, one for mental interaction, and one for post-mental interaction. For each of these three samples, at the end of each minute, the data sequence generated by the random number generator was analyzed with the Frequency and Runs tests in order to determine if there were any changes in the randomness of the sequence. A further 100 trials of three samples each of the same duration were collected during normal functioning of the device, as a control. The only evidence of an effect of distant mental interaction is an increase of approximately 50%, with respect to control data, of the number of samples within which the pre-determined statistical threshold for the detection of a reduction of the randomness was surpassed in both tests. Although the effect of distant mental interaction is still weak, we believe that the results of this study represent a proof-of-concept for the construction of electronic devices susceptible to distant mental influence.
Keywords: mind–matter interaction; random number generators; mind-controlled devices

INTRODUCTION

In this study, we present the findings of a new distant mind–matter (or PK) interaction study aimed not only as a further contribution to this classical line of research, but mainly as a proof-of-concept for a practical application of this phenomenon.

Distant mental activation of electronic equipment, that being without direct contact or electromagnetic means, seems impossible, but it becomes possible if we consider the ability to mentally alter from a distance the activity of random number generators, for example, the 0 and 1 sequences produced by a True Random Number Generator (TRNG).

Testing the possibility of mentally altering the function of random event generators began in the 1970s with the work of Helmut Schmidt, and later became one of the main lines of research within the Princeton Engineering Anomalies Research (PEAR) laboratory, directed by Robert Jahn and Brenda Dunne (Duggan, 2017; Jahn et al., 2007) employing four different categories of random devices and several distinctive protocols. They show comparable magnitudes of anomalous mean shifts from chance expectation, with similar distribution structures. Although the absolute effect sizes are quite small, of the order of 10^{-4} bits deviation per bit processed, over the huge databases accumulated, the composite effect exceeds 7σ ($p \approx 3.5 \times 10^{-13}$).

Even though a meta-analysis of 380 studies up to 2004, related to this phenomenon, showed a small effect and a large heterogeneity in the studies (Bösch et al., 2006; Radin et al., 2006) and was the object of criticism (Varvoglis & Bancel, 2016; Kugel, 2011), by modifying the interaction procedure and the type of data analysis we believe that it is possible to exploit this small effect for practical applications and, specifically, to activate from a distance an electronic device interfaced with a TRNG.

This device, which we have called MindSwitch2, is described in detail in The Electronic Device section of this paper. In contrast to almost all previous experiments, which required participants to mentally generate an increase in 0 or 1 states and then comparing them to a baseline, we simplified the procedure by asking participants to alter the normal random flow of 0 and 1 toward an excess of either 0 or 1. We thought this procedure more efficient with respect to the classical one since the possible effect of the mental interaction was not bound to a specific influence to the random flow of only the zeros or ones.

In fact, the efficacy of this procedure was confirmed in a study by Tressoldi et al. (2016), and a possible explanation for it was posited in the study by Pederzoli et al. (2017). In an initial pilot experiment, and later in a pre-registered experiment, the participants were asked to alter from a distance the function of a TRNG to reach the threshold level, fixed at ±1.65 z-score with respect to the theoretical average value. The number of mentally altered samples in the confirmatory study was 82.3%, versus 13.7% with no mental interaction.

To verify a reduction in randomness, in this study we applied the Frequency Test and the Runs Test present in the suite of tests provided by the National Institute of Standards and Technology (Bassham et al., 2010), as well as a calculation of the mean of the absolute difference between the ones and zeros in each sample (see Methods section).

The Frequency Test calculates the proportion of ones and zeros in a sequence and determines the probability of the calculated value's deviation from what would be expected if the sequence itself were totally random. The purpose of the Runs Test is to determine whether the number of runs of ones and zeros of various lengths is as expected for a random sequence. In particular, this test determines whether the oscillation between such zeros and ones is too fast or too slow.

The mean of the absolute value of the difference between the zeros and ones of each sample is a rough measure of entropy, indicating the extent of deviation from control conditions. The smaller the mean value, the smaller the absolute value of the difference between the zeros and ones.

The decision to implement these measurements derives from the theory that distant mental interaction may favor order where there is disorder, and therefore be able to reduce the randomness of data by increasing the number of zeros and ones, increasing the sequences of identical values (Burns, 2012), or both.

As a control, for each trial three sets of data were gathered, all for the same duration of time, one before, one during, and one after the mental interaction. In this way it is possible to minimize environmental interferences such as temperature or electromagnetic emissions, even though in normal conditions these factors appear to have no effect on the TRNG's activity.

As a further control of experimental conditions, another 100 trials were recorded mainly on the same days as the experimental data, at least one hour before and after with respect to the latter, each comprising three 15-minute samples of data.

Lacking sufficient information regarding both the ideal interaction duration and the most effective mental interaction strategy to use, we left the participants to decide on the most suitable mental strategy for themselves and to choose the duration of influence as either 5, 10, or 15 minutes.

The main confirmatory hypotheses of this study are that:

a) the samples obtained during distant mental interaction contain a higher number of data that exceed the probability cutoff of the Frequency or Runs tests of non-randomness and/or

b) that the means of the absolute differences between the zeros and ones is greater during the mental interaction than in the pre-interaction and the control phases.

Among the data collected immediately after the mental interaction phase, there is some evidence in the literature suggesting that the effect of mental interaction itself may continue for a certain period of time even after the termination of the voluntary interaction (Stanford & Fox, 1975; Tressoldi et al., 2016). The confirmatory hypothesis is that during the post-influence phase the same effects observed during the voluntary mental influence phase will be obtained.

There are no confirmatory hypotheses regarding the differences between these two conditions.

METHODS

Study Pre-Registration

Before any data were collected, the methods on which this study is based as well as statistical analyses of confirmatory hypotheses were pre-registered at https://osf.io/3g95p and at http://www.koestler-parapsychology.psy.ed.ac.uk/Documents/KPU_Registry_1049.pdf

Participants

Experienced and non-experienced participants were recruited among subjects known to the authors. Only those whose previous experience with this type of experiment was known to the authors were considered as experienced.

The participants were five men (average age 48 years; SD = 15) and eight women (average age 46 years; SD = 13), of whom three were experienced and ten were non-experienced.

As specified in the pre-registration, 100 trials were carried out in blocks of 5. Seven participants chose to contribute with 10 trials each, and the remaining 6 each made 5 trials.

The Electronic Device

The device named MindSwitch2, including its software, is described at https://github.com/tressoldi/MindSwitch so that it can be easily reproduced. In a nutshell, it comprises a single-board Raspberry PI mini-computer, a power bank, a TrueRNG, and a USB stick.

During the study, parameters for analysis of the TrueRNG remained fixed: 100 bits/sec for one minute, for a total of 6,000 bits, collected 15 consecutive times for each of the three phases: pre-mental interaction (PreMI), mental interaction (MI), and post-mental interaction (PostMI).

After each minute, the software analyzed the data using the Frequency Monobit Test and the Runs Test from the National Institute of Standards and Technology (Bassham et al., 2010), and, if the statistical analysis gave a p-value ≤ 0.05, a visual and auditory signal was activated (an LED was lit for 5 seconds and a 1-sec acoustic signal was emitted).

The results of each of the 15 measurements were recorded on the USB to be exported and analyzed offline. A copy of the raw data is available at https://figshare.com/articles/MindSwitch/8160269.

These parameters were decided after a series of pilot tasks. Before data collection, the preregistered parameter of 200 bits/sec was changed to 100 bits/sec in order to reduce the Raspberry PI processing time.

Procedure

The dates and times of each trial were agreed upon between the participant on duty and the first author. On the agreed day and time, the first author contacted the participant via Skype. After at least one practice attempt to acquire confidence with the procedure, the formal series of trials began at one or at most two per day (e.g., morning and evening), so as to ensure the participant's best mind–body efficiency. The shortest distance from the MindSwitch was approximately 15 km, the longest distance approximately 4,000 km.

Each trial consisted of three successive, 15-minute phases: before (PreMI), during (MI), and after mental interaction (PostMI).

The first author activated MindSwitch2, located at least 5 meters from himself in a room with a constant temperature of about 20 °C and far from any electromagnetic energy sources, including the PC used for the Skype connection. During the mental interaction, the first author, after having given the participant the go-ahead to begin the distant interaction, moved away from the monitor for the entire duration of the session and returned to it after the elapsed time to terminate the session.

All participants were given the following instructions:

Your task is to influence the output of the flux of 0's and 1's generated by the TrueRNG connected with our apparatus [they are shown MindSwitch2], reducing or increasing either the 0's or the 1's. If you are able to alter this flux of data up to a given threshold, you will activate a red LED and hear an acoustic signal. Do you prefer to directly look at the MindSwitch2 or not?

In the case of an affirmative response, they were able to see the MindSwitch2 via the Skype camera. When the response was negative, for example if the participant believed it to be a distraction during the interaction, the camera was switched off.

Furthermore, they were asked if they wanted to receive the results after each trial or at the end of their participation. The results were summarized to show them the number of MindSwitch2 activations before, during, and after their mental interaction, and a final evaluation as follows: positive (more activations during the mental interaction with respect to the pre- and post- conditions), negative (fewer activations during the mental interaction with respect to the pre- and post- conditions), or neutral (identical number of activations during the mental interaction and the pre- and post- conditions).

In order to not contribute direct influence on the MindSwitch during this interaction, the experimenter moved out of the place where the MindSwitch was located for the entire duration of the session.

Scoring

As described in the pre-registration, the dependent variables were the number of samples reaching a *p*-value of ≤0.05 for the Frequency Monobit or Runs Tests, and therefore a minimum value of 0 and maximum of 15 for each trial, as well as the average of the deviations of the absolute differences between the zeros and ones.

RESULTS

The number of trials with the higher number of MindSwitch2 activations in the comparison between MI vs PreMI, PostMI vs PreMI, and MI vs PostMI conditions, detected by the Frequency Test, the Runs Test, and both tests together, are presented in Table 1. These are raw values, but given that the total number of trials is 100, they may also be considered as percentages.

TABLE 1
Number of Trials with a Higher Number of MIndSwitch2 Activations in Comparisons of MI vs PreMI, PostMI vs PreMI, and PostMI vs MI Conditions, Detected by the Frequency Test, the Runs Test, and Both Tests Together

	MI vs PreMI	**PostMI vs PreMI**	**MI vs PostMI**
Frequency Test	29 – 34 [33 – 28]	34 – 31 [33 – 26]	30 - 41 [29 – 31]
Runs Test	24 – 35 [29 – 36]	30 – 36 [29 – 37]	30 – 30 [34 – 28]
Frequency & Runs Tests	**9 – 3** [4 – 4]	5 – 3 [2 – 4]	**9 – 5** [4 – 2]

MI = mental interaction. PreMI = pre-mental interaction. PostMI = post-mental interaction. [ ] = the same data related to the three samples of the control trials, 2nd vs 1st, 3rd vs 1st, 2nd vs 3rd. Differences from 100 are ties. Bold numbers = the main differences.

Means of the Absolute Differences between Zeros and Ones

The number of samples with a higher mean of the absolute differences between 0s and 1s is presented in Table 2.

TABLE 2
Number of Trials with Higher Mean
of Absolute Differences between Zeros and Ones

MI vs PreMI	Post-MI vs PreMI	MI vs PostMI
48 – 51 [50 – 50]	45 – 55 [58 – 42]	49 – 51 [40 – 60]

MI = mental interaction. PreMI = pre-mental interaction. PostMI = post-mental interaction.
[ ] = the same data related to.

Comment

With respect to the confirmatory hypotheses, the only dependent variable that seems influenced by the MI is the detection of non-randomness by both the Frequency Test and the Runs Test within the same sample of data (see Figure 1).

In short, in favor of the MI effect we see a difference of 6 trials with respect to the PreMI phase; a difference of 4 with respect to the Post-MI phase, of 5 with respect to the first and second control series, and of 7 with respect to the third control series.

Even if, as described in the pre-registration, these differences can be analyzed from a statistical point of view, we believe that applying inferential statistics to these data is inappropriate in that it is not possible to generalize our results to include other participants and experimenters.

In every case the results of a statistical comparison between the 9% of observed events in MI and the 3% of observed events in PreMI, gives a Z value = 1.78, $p = 0.036$ (one-tailed); the comparison of the 9% observed events in MI and the 4% observed in the control conditions, gives a Z value = 1.43, $p = 0.07$ (one-tailed).

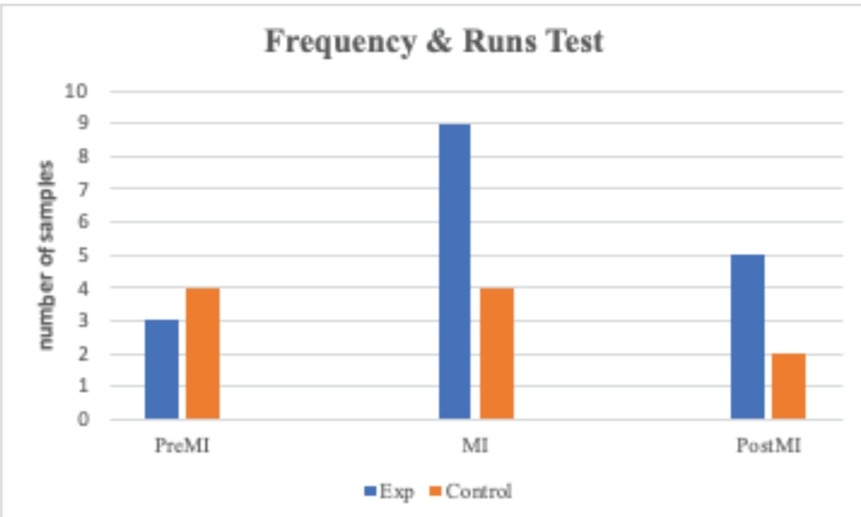

Figure 1. Number of samples where the reduction of randomness was detected by both the Frequency and the Runs tests.

Exploratory Analyses

We wanted to analyze the trend of the absolute differences between zeros and ones recorded in all sample data in the control PreMI, MI, and PostMI phases. Remember that the greater this value, the lower the entropy (randomness) of the sequences of zeros and ones generated by the TRNG.

We therefore counted the number of samples in which these differences exceeded the threshold value of 150, which corresponds to a p-value = 0.05 in the Frequency Test, after which we also did it for those above threshold values of 160, 170, 180, 190, and 200. The results are illustrated in Figure 2.

As shown clearly in Figure 2, the number of samples indicating less entropy, and therefore a larger difference between zeros and ones, is greater in the PostMI condition, followed by PreMI, but the variation disappears when the differences are >190. Furthermore, the number of samples observed in the MI phase is comparable with what is seen in the three control phases.

While for the PostMI phase this result was expected by positing

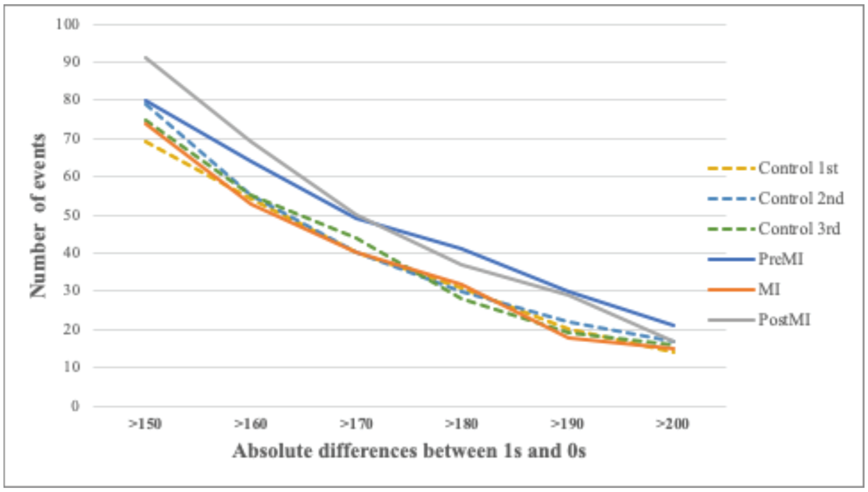

Figure 2. Trend of the number of times that the differences between zeros and ones differed by >150 to >200 in the samples of data of the PreMI, MI, PostMI, and three control phases.

a type of "tail or wave effect" of the MI phase, what was observed in the MI and PreMI phases was unexpected and will be dealt with in the Discussion section.

DISCUSSION

For the time being, mentally influencing MindSwitch2 from a distance does not seem as easy as manually flipping a switch on any type of electronic equipment.

In this experiment the only parameter that appears to be influenced by distant mental interaction is the reduction of randomness detected by the Frequency and Runs tests within the same sample of data. Even though the absolute value is not high—9 samples out of 100—it is however almost twice as much as the PreMI, PostMI, and control phases, as shown in Figure 1.

Do the results of this experiment represent a proof-of-concept of the possibility of creating electronic devices that can be mentally controlled from a distance? We believe so, because our results suggest that it is possible to start to improve the mental-signal/noise ratio of the random number generator ratio.

To reduce the random number generator's noise, apart from seeking those with more stable entropy, new more efficient algorithms to detect reduced randomness could be tested. Furthermore, we still don't know the ideal length of string bits that can maximize the mental signal's effect.

Moreover, how can the mental signal be strengthened? The answer to this question is unfortunately still vague. For example, is there a "dose-effect"—in other words, will the signal improve as the interaction's duration is extended? Of the eight participants who altered the data flow in the MI condition (1) by simultaneously exceeding the statistical thresholds of the two statistical tests, 4 of them had an interaction of 10 or 15 minutes and the other 4 for only 5 minutes. Therefore, this experiment does not seem to highlight a "dose-effect" linked to the duration of the mental interaction.

We wonder if there is evidence of some sort that will allow us to determine whether direct mental influence strategies are more efficient than non-direct mental strategies, such as:

Direct Mental Strategies:

I mentally created a flash of light forming a connection cable to MindSwitch. (Participant #11)

I 'asked' and 'hoped' for it to turn on and mentally repeated the request. (Participant #5)

Indirect Mental Strategies:

I attempted, with the aid of spiritual music, to create a field of positive emotion surrounding MindSwitch. (Participant #8)

I cleared my mind of random thoughts. (Participant #1)

For now, we have no answer to this question either.

Furthermore, if we look at the information in Figure 2, which shows that lower entropy events are more common during the PreMI phase than in the MI phase, still more doubts arise as to the ideal strategy for distant mental influence.

We remind readers that the PreMI phase occurred in the 15 minutes preceding the MI phase, therefore during a time when the participants were certainly not attempting any voluntary influence of MindSwitch2, but they were indeed preparing to do so by planning the mental strategy to be used after forming a clear image of the end goal.

To summarize, even if we are convinced we have offered a proof-of-concept of the feasibility of a practical application of the mind–matter interaction at a distance with electronic devices, this experiment underscores the many unknowns remaining, before we can improve the "mental signal / noise ratio."

Obviously, these comments are applicable only to what was observed in this experiment. More precise answers will come forth only from further data collection using other participants, other experimenters, other types of random number generators, and analytical algorithms to assess the reduction in entropy of the bits sequences.

NOTE

[1] See the per-participant results in the file MindSwitchExperimentSummary.xlsx at https://figshare.com/articles/MindSwitch/8160269

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