I.

A Replication of the Slight Effect of Human Thought on a Pseudorandom Number Generator

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ABSTRACT

Experiments conducted and repeated worldwide over the last five decades have claimed to show that human consciousness, intention or thought (often termed 'psychokinesis' or 'telekinesis') can have an effect on random number generators. The reason for this, or even its acceptance by mainstream science, is still uncertain. Quantum mechanics or some other as yet undiscovered aspect of the natural world is typically preferred as a tentative explanation compared to mysticism or invoking the supernatural. Given that many different types of computer programs – even those used in experiments and simulations – rely to some extent on (pseudo)random number generators, any external effect such as this could be significant and should be accounted for. To test if a random number generator used by a computer program could be affected by psychokinesis, we developed a simple program that generated a sequence of 30 random integers between 1 and 10. Along with its mean or average, this constituted one 'cycle'. Thirty cycles were evaluated and the 'overall' average was used as a means of comparing situations where, using two subjects, human thought was directed at increasing or decreasing the values of the numbers generated and where it was not (the control). Consistent with previous 'successful' experiments, a small but noticeable and significant effect on the overall averages was present. While this remains fascinating yet of little consequence in and of itself, the potential of a kind of 'butterfly effect' in computer systems where random number generators are involved in proximity to humans should be further investigated.

Key Words: psychokinesis, mind-matter interaction, pseudorandom number generator, random number generator, RNG, computer

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Introduction

Psychokinesis (PK) or telekinesis (TK) can be understood as the supposed ability to influence or move objects by mental effort alone. TK may imply doing so at a distance. PK can furthermore be classified into 'micro-PK' and 'macro-PK'. The former includes affecting systems like random number generators (RNGs) whereas the latter typically involves influencing a physical object, such as moving a box of matches. More common but no less fascinating is therefore micro-PK. This research came about from a curious observation we had related to a completely different field, i.e. artificial intelligence (AI). We noticed that an automatic chess problem composer – incorporated into an earlier program called CHESTHETICA (running in the background on several machines for experimental purposes) – was seemingly more efficient on the computers that were actually also being used for other purposes than those that were, for lack of a better term, 'ignored' and dedicated solely to running the program. CHESTHETICA uses a stochastic approach, i.e. some randomness, in its composing method (Iqbal, 2011). There seemed to be no logical reason why one computer running the program should yield significantly better results than another given the same number of composing 'attempts' so we

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decided to look into the possible effect of micro-PK.[2] In the next section, we briefly review some material in the area of PK and TK. Section 2 details the experimental setups and results. Section 3 provides some discussion of the results. Section 4 concludes with a summary and notes on further work.

1. Brief Review

PK or TK effects may not yet have met the standard of scientific inquiry to the point where its existence is beyond reasonable dispute. The main problem seems to be with regard to replicability – a cornerstone of the scientific method. In short, regardless of all the detailed statistical evidence, it does not always work and even when it does the effect is usually slight, at best. There are also many instances in which a more prosaic alternative explanation – usually offered by critics or skeptics aided by Occam's razor – is quite possible as well. A good and arguably balanced review of the 'best years' of the field involving the pioneering works of J. B. Rhine, Helmut Schmidt and the Princeton Anomalies Research (PEAR) program can be found in (Broughton, 1991). An earlier, more condensed overview is available in (Jahn, 1982). A more recent and personal account of long-term training in psychokinetic ability using a 'psi wheel' and testing for its scientific validity – though not under laboratory conditions – can be obtained online in Part 6 of (Sloan, 2013). This research is more akin to Sloan's work but presented in an academic format; mainly because the results were unexpected and outside our main field of expertise but deemed worth reporting nonetheless.

The skeptic's viewpoint, on the other hand, is well-explicated in several sources. Notably, Wiseman and Haraldsson (1995) explain how trickery could not entirely be ruled out concerning the macro-PK abilities of one South Indian Swami; see also Haraldsson and Wiseman (1996). In (Wiseman and Greening, 2005), they show how even verbal suggestion by the PK practitioner – related to key bending, in this case – can influence the opinions of observers to a significant degree. Parapsychologists have also been accused of paying attention to only positive results but ruling out negative ones as being non-conducive to psychic or psi ability (Wiseman, 2010). This, however understandably biased in the eyes of skeptics, may simply be based on the assumption that psi ability may not be subject and amenable to the standard scientific method; i.e. psi may not be a part of the 'natural world' in the traditional or strict sense. Just as consciousness or human experience, however real they seem to us, may not be (Shear, 1997). Chalmers (1995, 2010), for instance, suggests consciousness may be a new fundamental property of nature, in some ways like electromagnetism, requiring new basic properties and laws. It is also difficult to determine for sure whether it is the experimenter or operator producing the PK effect. This might explain why when skeptics try to replicate psi experiments, they tend to be less successful; so it may be preferable experimenters do it themselves (Pitkänen, 2012). If this is true, it would help explain some of the results obtained in *this* research. Other references on similar but not quite related phenomena such as 'remote viewing' that might be of interest to some readers include (McMoneagle, 2002; Wilson, 2011; Wiseman and Watt, 2010).

In this article, however, the interest is with regard to *micro*-PK effects using a RNG. These have been performed over the decades progressively using dice, radioactive decay, and the latter transformed into bits (0s, 1s) for computer storage. Quantum noise in transistors and quantum tunnelling may also be used. Typically, the participant's task is to influence mentally the RNG to produce, for instance, more 1s than 0s for a predefined number of bits (Bosch et al., 2006). In general, a small effect has been found (ibid.) but meta-analyses such as these have also been criticized by skeptics as being prone to publication bias and poor methodology, among other reasons (Wiseman, 2010; Kugel, 2011). In any case, the RNG used in *this* research was not based on a 'true' RNG as is usually the case but rather an algorithmic or pseudo one which makes the results even more interesting because the same small effect was confirmed (Lowry, 1981; Radin, 1982, 1990-91; Radin and Utts, 1989; Shimizu and Ishikawa, 2010). This would be of relevance to computer programs where randomness is a component, such as simulators that rely on Monte Carlo methods, cryptographic applications and games of chance.

[2] In one particular case, the composing program running on the *same* computer yielded over twice as many successful compositions in less than half the processing time when simply placed in proximity to the author compared to being placed at a more distant location in the room. However, at this point, this is merely anecdotal evidence.

2. Experimental Setups and Results

A simple computer program was written using the Visual Basic 6 programming language. The programming language itself is irrelevant to the experiments and theoretically any would suffice. It generates 30 random numbers (integers) between 1 and 10, in list form, with a brief pause of about a third of a second from one number to the next. This was to prevent the experiment from concluding too quickly, i.e. before the human subject had time to get into the right frame of mind. The average or mean value to one decimal place – higher precision makes comparisons more difficult and less meaningful – is automatically computed and recorded by the program in an ASCII text file. This constitutes one 'cycle'. The list of 30 numbers is then erased from the program's interface (see Fig. 1) before the next cycle begins; 30 cycles were run for statistical comparison purposes. So after each cycle of 30 random numbers generated, we may have an average of say, 5.6 and after 30 *cycles*, we have a sequence of averages (e.g. 5.6, 5.4, 5.8, 6.2...) based on 900 numbers which are then averaged again for an overall average of maybe, 5.54.

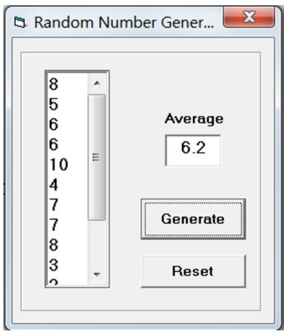

Figure 1. The simple RNG program interface.

An increase or decrease in this overall average is therefore a reasonable indicator of divergence. Computer programs usually have built-in RNG functions that can be called upon by other functions or subroutines. As such, they are essentially algorithmic in nature but rely on a random 'seed' which can be obtained from the state of the computer system, such as the current time. This is why they are also known as *pseudo*random number generators. A 'true' RNG based on, for example, the decay of the isotope cesium-137, was not considered suitable because our main intention was to investigate the phenomenon as it relates to randomness in typical computer programs. In any case, it would seem that any measurable exerted effect of human thought on what should be algorithmic and 'fixed' should be considered even more remarkable. The complete source code of the program is given in Appendix A.

Two experiments were performed using one human subject each, i.e. the author himself (subject 1) and a female research assistant (subject 2). In each experiment, there was one set of 30 cycles that functioned as the control, during which the subject did not focus any thoughts on any numbers. There were two more sets of 30 cycles for each subject where they focused their thoughts toward the numbers 7 through 10, and later 1 through 4. The former was intended to raise the overall average of random numbers generated and the latter to reduce it. 'Focusing thought' here can be described as genuinely *hoping* or *silently rooting* for the numbers in the ranges specified, e.g. to appear in the list or in one's mind. Both subjects used different computers to compensate for any kind of software or hardware anomaly that might influence the program, however unlikely. The random number generation process for each set took about 7 minutes to complete.

Computer A, used by subject 1, was a 32-bit desktop machine (Intel(R) Core(TM)2 Duo CPU E8400 @ 3.00GHz) running the Windows 7 Pro Service Pack 1 operating system with 4 GBs of RAM whereas computer B, used by subject 2, was a 64-bit notebook machine (Intel(R) Core(TM) i3 CPU M 370 @ 2.40GHz 2.40GHz), running the Windows 7 Home Premium operating system with the same amount of RAM. Each of these experiments, once set up correctly, was performed only once and the results recorded as they occurred, i.e. they were not repeated until a more satisfactory result was obtained. There was no 'laboratory environment' due to financial constraints; subject 1 worked privately in a closed office whereas subject 2 worked privately in a cubicle. At least in the case of subject 1, the thought-focusing process was found to be physically exhausting. The results are shown in Table I. 'High' and 'low' represent the highest and lowest means obtained from the 30 cycles. 'Average' in the table represents the overall average after 30 cycles. The standard deviation (SD) is given below it.

Table I. Overall averages, medians, modes, highs and lows of the random number generator after 30 cycles or 900 integers.

	Subject 1 (Computer A)					Subject 2 (Computer B)				
	Average	Median	Mode	High	Low	Average	Median	Mode	High	Low
Control	5.43 SD 0.46	5.40	5.40	6.20	4.30	5.46 SD 0.48	5.40	5.40	6.50	4.40
Focus on 7-10	5.65 SD 0.49	5.75	5.80	6.50	4.80	5.59 SD 0.56	5.65	6.20	6.50	4.30
Focus on 1-4	5.32 SD 0.50	5.40	5.60	6.40	4.30	5.42 SD 0.46	5.50	5.60	6.40	4.20

For each subject, a single-factor ANOVA (analysis of variance) test was used to compare the overall averages for the three sets. For subject 1, the overall averages differed to a statistically significant degree; F (2, 87) = 3.61, p = 0.031. For subject 2, they did not; F (2, 87) = 0.97, p = 0.382. Given the rather low statistical power of the experiments and since neither subject had been previously identified as a particularly 'special skilled' individual, we also treated both as randomly-chosen subjects and combined the results; see Table II. The overall averages, in this combined case, differed to a statistically significant degree; F (2, 177) = 4.16, p = 0.017. The raw data are available in Appendix B. The distributions for all nine sets, including the combined case, were all normal based on the Anderson-Darling (basic) test.

Table II. Combined results.

	Subjects 1 & 2 Combined (Computers A & B)				
	Average	Median	Mode	High	Low
Control	5.45 SD 0.47	5.40	5.40	6.50	4.30
Focus on 7-10	5.62 SD 0.52	5.70	5.20	6.50	4.30
Focus on 1-4	5.37 SD 0.48	5.40	5.60	6.40	4.20

3. Discussion

Three things are particularly noteworthy from the experiments and results presented in the previous section. First, we are not dealing with the random numbers themselves that were generated, but rather the average or mean after each cycle. This presents a better indication of what the *trend* of random numbers generated in each cycle was, i.e. if they were tending toward higher or lower numbers. Second, despite the lack of *statistical* significance given the mental efforts of subject 2, the raw overall average values shown in Table I still conform to expectations, i.e. when focusing on 7-10, it was higher (5.59) than the control set (5.46) and when focusing on 1-4, it was lower (5.42). Third, these experiments, once set up correctly, were performed only once. In other words, it could have been that while focusing on 1-4, either subject 1 or subject 2 caused the overall average to be *higher* than the control or while focusing on 7-10, *lower*. These would naturally have caused the results to appear even less convincing. Yet, they did not happen. All of this is also true when the results for both subjects were combined (see Table II).

We did not repeat these experiments for a reason. We are not sure what caused the intentional, thought-directed drift of random numbers generated by the program – at least in the case of subject 1 and the combined case – and are not sure if repeating the experiments a second or third time would have the same effect. The only known variable was the human thought factor and this is difficult to measure or even explain clearly, much less replicate. Regardless, the results obtained from these experiments were deemed worthy of reporting and are not being denied. They are perhaps best replicated by *other* researchers. Additional though perhaps slightly unusual information related to the experimental work can be found in Appendix C.

In summary, what we can report with some confidence is the slight – perhaps arguably *very* slight – but nonetheless statistically significant effect of human thought on a RNG used in a computer program. It did not happen with both subjects but this may simply be because people and their thought patterns can differ. The finding is apparently consistent with what other researchers since the 1960s have experienced and reported. The fact that such an effect also registers given an *algorithmic* or pseudo-RNG is perhaps even more difficult to explain. Human thought or consciousness, it would seem, and for lack of a better 'natural' explanation, is able to exert an intentional and even *directional* force on the outputs of such systems. Even though very slight, such a force could result in a 'butterfly' or 'domino' effect in computer systems which incorporate RNGs – pseudo or otherwise – and this might explain certain presently inexplicable computer system glitches, malfunctions and failures. Electromagnetic interference (EMI), on the other hand, which is known to interfere with computer systems, is more easily identified and almost always causes damage. We do not think EMI was responsible for the results obtained in these experiments because the RNG did not *fail* but rather performed as intended by the human subject.

4. Conclusions

The experiments performed in this research were by the author and his research assistant. They were not elaborate experiments under controlled laboratory conditions because we lacked the resources for this unexpected tangent of investigation in our typical AI-related research endeavours. Even so, the results and events reported here are as they occurred and to the best of our memories. Reports of PK phenomena are nothing new in the scientific literature. However, proving them beyond a reasonable doubt, so to speak, has remained exceedingly difficult. We have reached the point where most researchers would rather abandon even talk of it for fear of ridicule. Most researchers have probably never even heard of such a thing. We believe that such experiments and events, however implausible, should be recorded as accurately as possible for posterity. We may today simply lack the knowledge and equipment necessary to make better sense of these phenomena.

In our case, the main intention was to determine if micro-PK could have a tangible effect on computer programs which use RNGs. The experimental results indicate that, at least for some people, it is quite possible. Some people, with the right thought patterns or frame of mind, could be influencing machines in this way either intentionally or perhaps even unintentionally. We do not know exactly how they do it. *They* do not know how they do it. We are also not sure the extent to which computer systems may be affected, if at all. However, we do believe more research in this direction is worthy of investment. It has the potential of not only shedding more light on human abilities, but also saving billions of dollars in unexpected computer behaviours and system failures worldwide.

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Appendix A

Visual Basic 6 Source Code of the Random Number Generator Program

```
Public Function Generate_Random_Number(lower_limit As Integer, upper_limit As Integer) As Integer
'returns a random number between a certain range
upper_limit = upper_limit + 1
'this is necessary because the randomize function below can generate a highest number of only one integer less than the upper limit specified

Do
'since the numbers generated start from 0, it keeps generating until it meets the minimum lower limit
   Randomize
   Generate_Random_Number = Int((upper_limit * Rnd))
   'generates a random number (within the range)
   DoEvents
Loop Until Generate_Random_Number >= lower_limit

End Function
Private Sub Generate_Click()
Dim i As Integer, k As Integer, n As Integer, rnd_num As Integer, sum As Integer
Dim avg As Double, j As Double
```

```
For n = 1 To 30
  For i = 1 To 30
    rnd_num = Generate_Random_Number(1, 10)
    sum = sum + rnd_num: avg = sum / i
    number_list.Text = number_list.Text & rnd_num & vbNewLine
    avg_box.Text = Round(avg, 1)
    k = k + 1
    For j = 1 To 50000000
    'time interval
    Next j
  Next i
  Open App.Path & "\" & "results.txt" For Append As #1
  Print #1, n & vbTab & avg_box.Text
  'writes the average to a text file
  Close #1
  sum = 0: avg = 0
  number_list.Text = vbNullString: avg_box.Text = vbNullString
Next n
End Sub
```

```
Private Sub Reset_Click()
number_list.Text = vbNullString
End Sub
```

Appendix B
Experimental Raw Data

	Subject 1			Subject 2		
Cycle	**Control**	**7 to 10**	**1 to 4**	**Control**	**7 to 10**	**1 to 4**
1	5.1	6.4	5.6	4.9	6.5	6.4
2	5.2	5.8	5.1	5.3	5.2	5.9
3	5.3	5.9	6.4	5	5.7	5.3
4	5.3	6.1	4.8	5.4	6.2	4.7
5	5.8	5.8	5	5.4	6.2	5.1
6	5.4	5.2	6.3	6	5.3	5.6
7	6.2	5.3	4.5	4.4	6.2	5.2
8	5.8	6.5	4.8	4.6	5.1	5.1
9	5	6.1	5.3	5	6.2	5.1
10	5.1	5	4.3	5.8	5.2	5.5
11	5.4	5.2	5.7	5.9	5.5	5.8
12	4.9	5.4	4.8	5.3	5.5	5.3
13	5.4	5.7	5	5	5.9	5
14	5.1	4.9	5.3	5.5	5.6	5.6
15	5.4	5.1	5.1	5.6	5.8	4.2
16	5.1	6	5.8	5.2	6.4	5.9
17	5.8	5.3	4.9	5.7	6	5.5
18	4.3	4.8	5.4	5	5	6.1
19	6.2	6.4	5.4	6.5	5.8	5.6
20	5.9	5.2	5.6	5.7	5.2	5.8
21	5.4	5.8	5.5	5.6	4.3	5.5
22	5.6	5.8	5.4	5.4	4.7	5.2
23	5.4	5.9	5.7	5.5	6	5.2
24	5.6	5.3	5.3	6.4	5.3	5.7
25	5.9	5.1	5.5	5.9	6.2	5.7
26	6.2	6.1	5.6	5.4	5.7	4.8
27	4.7	6	4.4	6.2	4.7	5.3
28	6.1	6.4	6	5.4	5.2	5.6

29	5	5.4	5.6	5.4	6.1	4.9
30	5.3	5.6	5.5	5.5	5.1	6

Appendix C

Additional Information

In the interest of not leaving anything out that may be of importance to someone someday, subject 1 also experienced, during the experiment, with his eyes closed, what can be described as a sort of dark blue 'ink' pattern on a black background appearing in his mind. It appeared on its own and continued to reshape slowly and randomly. During *one* of the three sets (i.e. focusing on 7-10), after a few minutes, it formed into an 'outside-in' *moving* pattern of concentric circles like shown in Fig. 2. This happened unintentionally and only once.

Figure 2. The concentric circle pattern (without the black background for proper contrast).

After this one set was completed, subject 1 noticed that a figurine chess set that happened to be directly behind the computer running the RNG program – about four feet away from the computer table on a separate cabinet – had one of its pieces, a 4.5 inch tall rook weighing about 1 lb, moved. Figs. 3(a) and 3(b) show this unusual displacement that did not seem to affect any of the other neatly placed pieces.

(a) (b)

Figure 3. The displaced chess piece.

Subject 1 is quite certain that the chess set was not in this state prior to the experiment. The pieces are always neatly arranged in their squares. The office is completely closed and air-conditioned so there were no gusts of wind. There were no tremors or movements before during or after the 7-10 focus session was completed. Walking past the set in order to 'graze' it or picking up an object nearby did not seem to be able to cause this kind of displacement, and never has in all of the years the set has been there. In any case, because the event was completely unexpected and could not again be replicated, it remains to us an unsolved mystery. It may be a case of unintentional *macro*-PK but as with all psi experiments apparently, *what exactly* needs to be done to make this happen is still unclear.

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