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Lunar-magnetotail Encounters as Modulators of Mind-Matter Interaction Effects

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Abstract

Mind-matter interaction (MMI) effects are controversial partially due to a lack of a theory that persuasively explains such effects, and also due to the difficulty of replicating empirical effects in controlled experiments. One potential explanation for this empirical capriciousness might be the presence of physical factors which modulate MMI performance. One previously suggested variable has been the Earth's geomagnetic field; another is the lunar phase. The hypothesis that the Moon's interaction with the Earth's magnetosphere modulates MMI performance was tested in data collected in a long-term, online MMI experiment. The analysis showed a clear influence of the Earth's magnetotail in the MMI results, confirming the hypothesis. This suggests that phenomena relying on purported MMI may be more efficacious during quiet geomagnetic periods of the full moon, when the Moon is passing deep through the inner plasma sheet of the magnetotail

Introduction

Mind-matter interaction (MMI) is the hypothesized ability of the mind to influence matter or energy without the use of any currently known physical means. Spiritual healing, psychokinesis, distant healing, and unusual human-machine interactions might be based on MMI effects (Heath, 2003). Although hundreds of laboratory studies seem to provide evidence of MMI, the existence of such effects remains controversial because there are no convincing theoretical reasons to explain how such effects may exist (Bösch, Steinkamp, Boller, 2006; Radin, Nelson, Dobyns, Houtkooper, 2006). Barring theory, the central

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issue in this line of research has been the question of reliability. For example, a large-scale, multi-laboratory replication effort failed to repeat previously successful MMI experiments reported by Princeton University's Engineering Anomalies Research Laboratory (Jahn et al., 2000). While critics might point to the failure to replicate as evidence that MMI does not exist, another interpretation is that we do not fully understand the conditions under which MMI is best demonstrated. This prompted a search for environmental parameters which modulate the MMI performance via enhancing or reducing human powers of concentration.

Geomagnetic effects on human behaviour

The influence of subtle electromagnetic effects on our human nervous system has been a topic of scientific research for decades. Evidence of an effect of ELF electromagnetic fields on human pineal gland function was reported (Wilson et al., 1990) and rejected (Gobba, Bravo, Scaringi & Roccatto, 2006). Persinger found correlations of geomagnetic activity with enhanced anxiety, sleep disturbances, altered moods, and greater incidences of psychiatric admissions (Persinger, 1987). Researchers had reported that poltergeist episodes frequently begin on the day of a sudden and intense increase in global geomagnetic activity (Gearhart & Persinger, 1986). Sturrock (2004) analysed data of UFO events and found significant correlations with local sidereal time. Spottiswoode (1990) reported the existence of a negative correlation between scores in free response anomalous cognition experiments and geomagnetic fluctuations. Sudden infant deaths seem to be associated with continuous micropulsations in times when global geomagnetic activity is very low (O'Connor & Persinger, 1999). Increased solar and geomagnetic activity seems to be associated with increased arterial blood pressure (Ghione, Mezzasalma, Del Seppia & Papi, 1998). Distinct effects of the Moon on geomagnetic activity were also reported (Bigg, 1963; Bell and Defouw, 1964; Knott, 1975).

Despite the large volume of reports, in total we do not really understand the role of these electromagnetic and geomagnetic interactions on human behaviour. Neither do we understand the underlying mechanism of MMI effects. As a result, attempts to explore MMI effects by using patients as targets might raise serious ethical problems, since we don't know when MMI effects might be healing or harming others. All that have today is nothing more than some small pieces of a jigsaw. The use of MMI experiments with a random number generator as a target for the evaluation of the effectiveness of global geomagnetic activity on human behaviour does minimize the risk of adverse effects on the health of subjects and is thus ethically safe. It is a great way to learn more about this still unexplored realm of human ability and behaviour.

Lunar phase effects in MMI data

In an earlier study, Radin (1997) claimed evidence of MMI effects in casino pay-out rates which depended on the lunar phase. The peak effect was found within one day of the full moon. Based on many previous studies examining correlations between the strength of the Earth's geomagnetic field (GMF) flux and purported psychic experiences, it was predicted that the casino pay-out rates would be negatively correlated with GMF. Radin found a higher than average payout rate on full moon days of quiet geomagnetic activity, and a lower than average payout rate on full moon days with high geomagnetic activity. In both cases yet, the correlation would be negative. Thus, we may assume that the effects might cancel each other out.

These results might indicate that the human power of concentration is affected by a geomagnetic parameter. Recently, Sturrock and Spottiswoode (2007) reported a significant lunar-periodic effect in free response anomalous cognition experiment data, which might also confirm this relationship of a lunar-geomagnetic parameter and the human power of concentration.

Attempts to independently check Radin's claims using data from a large-scale, online MMI experiment revealed evidence for a complex solar-periodic full moon effect (Etzold, 2000; Etzold, 2002).

The Fourmilab Retropsychokinesis Project

Etzold (2005) analysed data of the Fourmilab RetroPsychoKinesis Project, an online experiment which "explores the purported anomalous effect known as retropsychokinesis"[1], also known as

[1]http://www.fourmilab.ch/rpkp/proposal.html

"retroPK". RetroPK is a hypothesized ability to retroactively influence random data via MMI. Another hypothesis, the Decision Augmentation Theory (DAT), attempt to explain retropsychokinesis effects with an anomalous information transfer by decision augmentation. This means that people are somehow able to foresee the future and intuitively feel which goal of the experiment might be more promising (May, Utts & Spottiswoode, 1995). If the DAT hypothesis is true, one would expect in case of strong MMI effects in the experimental data a reverse effect in control data taken from the same database. Since DAT can be reduced to intuitive data selection, this might be in fact a kind of data splitting. The lack of any reverse effects in control data might indicate that the hypothesis of retroactive influence is more qualified to explain the effects than intuitive data selection.

Random data for the Fourmilab test are derived from the HotBits hardware random number generator (RNG) based on radioactive decay[2]. Date and time stamps for each experimental result, downloaded from that website, were converted to a lunar phase in degrees. 105 Subsets or bins were created for each lunar cycle from January 1997 to October 2005 (Etzold, 2005). These MMI data were correlated with F10.7 solar radio flux, sunspot numbers, solar wind speed and GMF 'ap'-index data. Significant results were found for MMI data correlated with F10.7 solar radio flux and sunspot numbers. The correlation of the GMF 'ap'-index data with MMI data was barely significant on the p = .05-level. This barely significant result might depend on remaining diurnal variations in the GMF 'ap'-index data. Therefore we tried another analysis with reduced diurnal variations in the GMF 'ap'-index data, and we expected an increasing significance for the correlations of the GMF 'ap'-index data with MMI data.

The Moon-magnetotail interaction hypothesis

A hypothesis was suggested by earlier analyses that the Moon's interaction with Earth's magnetosphere during the Moon's passage through the magnetotail in full-Moon times might modulate MMI performance (Etzold, 2005). We wanted to test this hypothesis and see whether high and low MMI effects in the full-Moon interval could be explained by changing geomagnetic activity.

[2] http://www.fourmilab.ch/rpkp/experiments/contents.html

While the effective parameter responsible for modulating MMI performance remains unknown, analyses seemed to indicate that the origin of this parameter may be located in the lunar phase. We assumed more precisely that the actual source of this parameter may be based on lunar-magnetotail interactions.

As illustrated in Figure 1, the Earth's magnetosphere is distorted by the solar wind into a teardrop shape, which extends far into deep space (Tsyganenko, 1995). The magnetotail of this drop stretches in a direction opposite to the Sun, and reaches beyond the lunar orbit. The solar wind follows a path that goes around the Earth in a sort of cover or sheath. This is the magnetosheath plasma region. Between the magnetosphere and the magnetosheath is the magnetopause. The magnetotail is divided into the outer lobes and the inner plasma sheet.

During the full moon interval, the Moon passes the magnetosheath plasma and the lobes of the magnetotail for approximately four days (Schubert, Sonett, Smith, Colburn & Schwartz, 1975).

An indicator for the extent that the Moon spends in the magnetotail is the time the Moon spends in the inner plasma sheath (figure 2). This time varies from 0-15 hours per month at a minimum rising to 60-75 hours per month at the maximum with the 18-year Saros period (Hapgood, 2007) and with the varying solar activity (Tsyganenko and Sitnov, 2007) of the 11-year solar cycle. The lunar orbit is tilted in relation to the ecliptic, and in this way the Moon can pass above, below, or directly through the plasmasheet, depending on the Moon's position in the Saros period.[3] The last period of maximum length of time the Moon spent in the plasmasheet was from 1993 to 2001, and the next period of maximum length is expected around 2011 to 2019. These are very promising time intervals for studying fullmoon-MMI effects. From 2003 to 2010 there is a period of minimum length, leading to the expectation of low fullmoon-MMI effects. But even when the Moon is expected to pass through the magnetotail, a sudden collapse of the entire nightside field with the magnetotail can happen when a strong geomagnetic storm is triggered by high solar activity.

[3] An animated .gif-file created by M. Hapgood, showing the lunar crossing of the magnetotail around the full moon in December, 2007, is available at
http://uk.geocities.com/mike.hapgood@btinternet.com/moon_movie_6.gif.

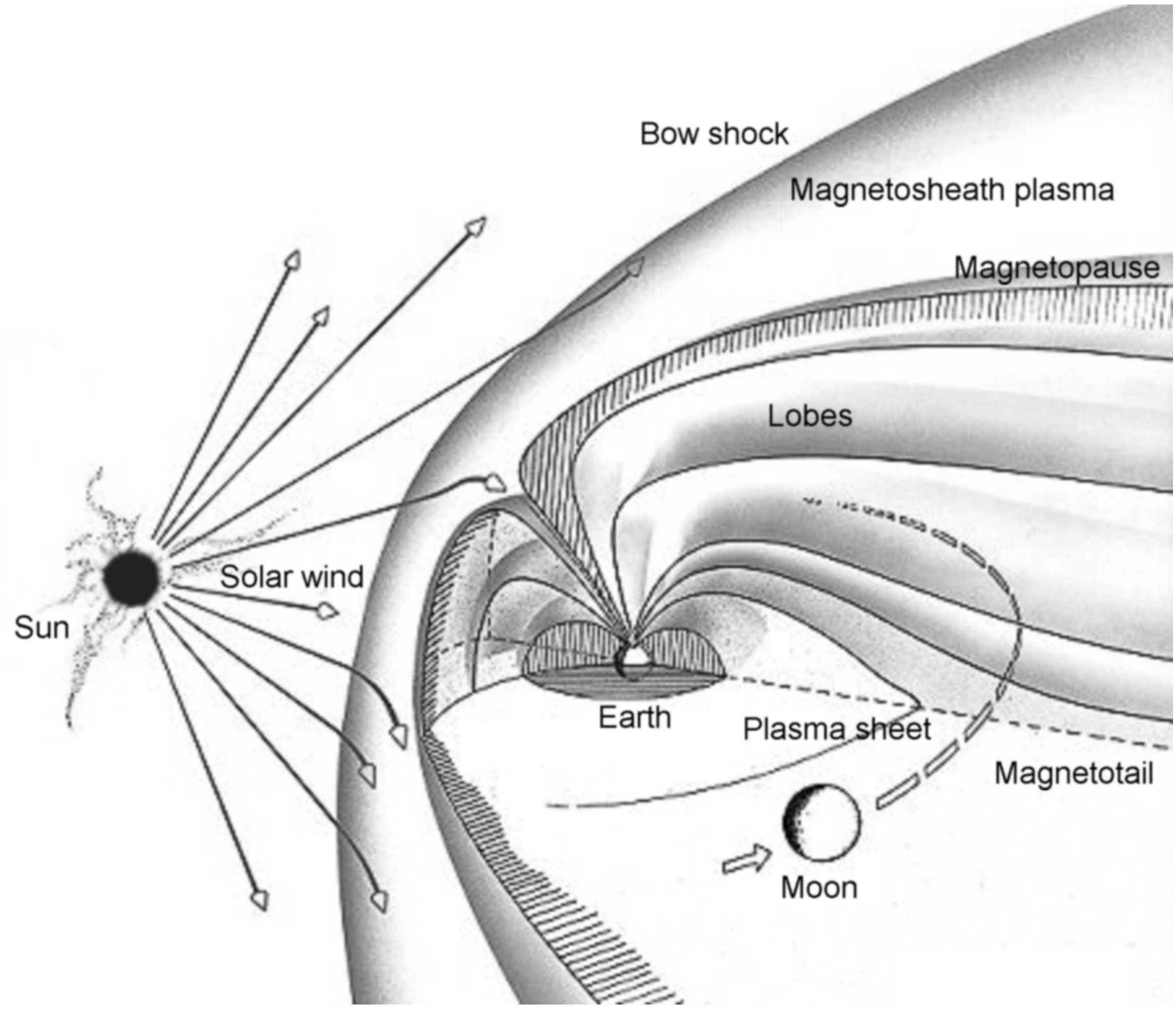

Figure 1. Earth's magnetosphere. Picture was provided by NASA.

In view of the hypothesis that an unknown parameter is modulating MMI performance which results from the Moon's interaction with the magnetotail, one might assume that the correlation of MMI data with GMF 'ap'-index data might yield more significant results. But this was not the case in the Etzold study (2005). Higher significance was found for perihelion parameters like F10.7 solar radio flux and sunspot numbers. The current paper will show that this lack of significance is due to the properties of the GMF 'ap'-index data. Therefore, the data in the present analysis were retrieved from the same retroPK database for the same evaluation period as mentioned before. These are all MMI data from the time period of January 11, 1997, 17:33 UTC through October 8, 2005, 12:45 UTC, all of which fulfil the specifications of the Fourmilab RetroPsychokinesis Project. Newer data were ignored and retained for future replication attempts.

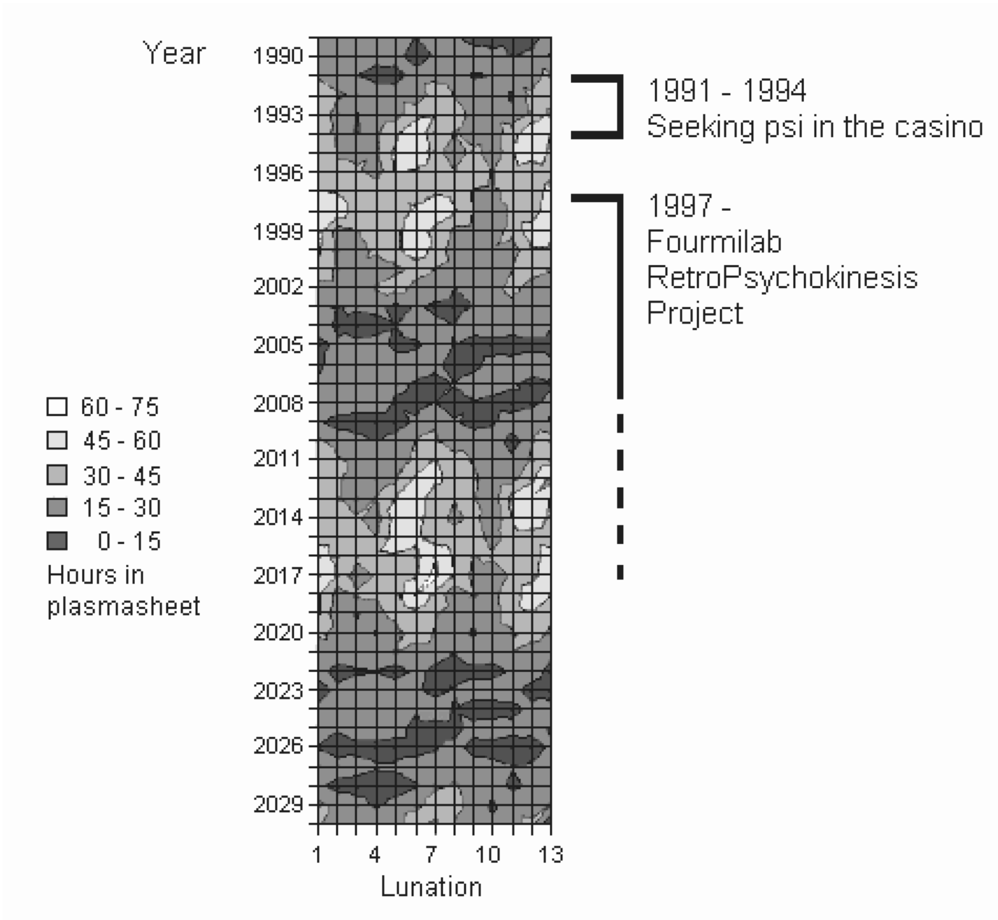

Figure 2. Hours, the Moon spends in the inner plasmasheet. Detail of a plot by Mike Hapgood (2007), and figure was treated by the author. Bright areas mark time intervals of deep lunar encounters with the inner magnetotail, and with a high fullmoon-MMI effect expectation.

Methods

We wanted to see what the solar-periodic full moon effect looks like because the lunar-GMF-MMI hypothesis stated that the Moon's interaction with Earth's magnetosphere during the Moon's passage through the magnetotail at full moon times might modulate MMI performance. We therefore scanned the data with a sliding window function over the whole lunar phase. We used the GMF 'ap'-index data which provide the average global geomagnetic field activity over a three hour period. The GMF 'ap'-index data were obtained in a fixed time interval of every three hours. This results in a constant number of GMF 'ap'-index data for every day of the successive lunar cycles.

Three different data bases are available on the Fourmilab server: MMI 'for the record' data, MMI 'practice' run data and control run data. Here, we are analyzing the MMI 'for the record' data and also 'practice' run data and control run data for a comparison.

The properties of the data

The MMI 'for the record' experiment data were only recorded when somebody was conducting an experiment. Thus, the amount of experimental data varied largely for the same interval of successive lunar cycles with a minimum of 152 and a maximum of 5,555 'for the record' experiments per lunar cycle. In total, 199,632 'for the record' experiments and 202,958 practice run results for the experiment time interval of January 11, 1997 to October 8, 2005 are evaluated. Since December 26, 1997 control experiments have also been running automatically, exactly one run every hour, totalling 59,860 as of October 8, 2005. The first and second generation HotBits configuration used a Windows 95 machine which "crashed every couple of months for no discernible reason"[4]. As a consequence, the Hotbits server was upgraded in September 2006 with a far more reliable Linux-based server (Fedora Core 5).

Further complicating matters is the fact that the control runs do not really match the MMI data. While there are 199,632 MMI experimental data in the evaluation period, only 59,860 control run data are at hand which are a little bit more then a third of the MMI data volume. In addition, practice run results were usually not reported. But due to the important issue of control data, we have to consider every source of information and as a result we looked at the available practice run results.

GMF 'ap'-index data and diurnal effects

The GMF activity varies in diurnal rhythm and with the location on Earth. Besides day and night changes, another reason for diurnal variations is the fact that Earth's geomagnetic poles do not conform with the Earth's geographic poles. As a result, Earth's magnetotail shifts in diurnal rhythms. However, the GMF 'ap'-index data represent a global average of GMF activity as an integer value with minimized

[4]http://www.fourmilab.ch/hotbits/hardware3.html

diurnal rhythm. For example, the exact full moon time might be in one lunar cycle at noon (*e.g.,* 12:00 UTC) with a lower GMF level and in the evening (*e.g.,* 18:00 UTC) of another lunar cycle when the GMF level is higher. Both time intervals might yield the same GMF 'ap'-index data value, but the effect of the lunar/GMF interaction might be completely different. Etzold (2005) computed the correlations of MMI data with GMF 'ap'-index data for every lunar cycle separately. For our evaluation here this means that we have to combine the data of multiple lunar phases in order to minimize diurnal effects and make the data compatible. This means that effects, by accumulation, become evident which are not present if we evaluate data of single lunar phases with much smaller volumes of data. Eight GMF 'ap'-index data values were obtained every day, and reduced diurnal effects in the MMI data can be expected if no fewer than four lunar cycles were included in each subset. This is the case if we divide the entire database into 16 subsets, each with 12,500 MMI 'for the record' experimental data, and the last with 12,132 experimental data. Date and time stamps of these data were converted into lunar phase in degrees and sorted according to ascending lunar phase for each subset.

The control run, practice run, and GMF 'ap'-index data were also divided into 16 subsets but with a different number of experiments per subset with respect to the time intervals of the MMI data to enable comparability of the results. Date and time stamps of these data were also converted into lunar phase in degrees and sorted according to ascending lunar phase for each subset.

Configuring the full moon interval & tests with different sliding window widths

The time interval which the Moon spends in the magnetosphere is estimated at four days. Radin and Rebman (1998) mentioned an interval of one day within the full moon period in which the full moon effect was found in the casino data. Including the day before and the day after the full moon day, this constitutes an interval of three days centered around the time of the full moon. On one day the Moon moves 12.19° along its orbit on average. Thus, Radin's full moon interval is equivalent to 161.7° to 198.3° lunar phase. Etzold (2000) mentioned a lunar phase interval of 166.5° to 192.4° of approximately two days. Since we compute time intervals in lunar phase in degrees, we have 25° lunar phase as a minimum for a two-day interval and 50°

lunar phase as a maximum for a four day interval. For finding the maximum magnitude of an assumed full moon effect in the MMI data, we check all data in steps of 5°, beginning with 25° and ending with 50°. This different window size test should ensure that the effect is not sensitive to the percentage of the lunar cycle that is analysed.

The data of each MMI subset and the corresponding GMF 'ap'-index data subset were sorted according to the the increasing lunar phase with overlapping data for the new moon interval. A computing function with a window width of 25° up to 50°, starting with 0° and up to 360°, overlapping in the start and end-interval, scanned simultaneously the first MMI subset and the corresponding GMF 'ap'-index data subset synchronously from the beginning to the end and calculated the correlation value for every step (0.5°). The sliding window function computed the MMI average effect size and the average GMF 'ap'-index value for every step. For these values, Pearson's r was computed. Since we have 16 subsets, we get 16 Pearson correlation values for each step of the sliding window function. The following checklist displays the basic steps of the analysis:

1. Download the MMI data from the Fourmilab server[1].
2. Convert UNIX time into UTC date and time, and hexadecimal experiment data into a bit score.
3. Divide the dataset into 'for the record' and practice data.
4. Check databases for data which do not conform with the Fourmilab Retropsychokinesis Project specifications.
5. Create 16 subsets with 12,500 MMI experimental data lines each.
6. Convert date and time of each experiment into a lunar phase degree with 0° for new moon, 90° for the first quarter, 180° for full moon and 270° for the last quarter.
7. Sort data according to increasing lunar phase for each subset, starting with 0° and ending with 360°
8. Copy data with lunar phase < 60° and add 360 for every subset. Insert these data at the end of each subset for overlapping scans at new moon position.
9. Perform the same procedure for control run and practice run data.
10. Download GMF 'ap'-index data[5].

[5]The GMF 'ap'-index data were retrieved from the World Data Center for Geomagnetism, Kyoto. http://swdcdb.kugi.kyoto-u.ac.jp/

11. Eight GMF ‘ap’-index data were obtained per day. Complete hour and minute information of the middle of each three-hour ‘ap’-index interval.
12. Take date and time of the beginning and the end of each MMI data and divide the GMF ‘ap’-index data into corresponding subsets.
13. Do steps 6 to 8 with GMF ‘ap’-index data.
14. Create a sliding window function which computes Rosenthal’s effect size for the MMI, practice and control run data and the average values for the corresponding GMF ‘ap’-index data.
15. Adjust the window width of the sliding window function (25°, 30°, 35°, 40°, 45°, and 50°).
16. Move the sliding window in steps of 0.5° over the entire lunar phase synchronously over all subsets.
17. Correlate the effect size values with the average GMF ‘ap’-index data for every sliding window step.
18. Plot the Pearson correlation values.

Tests with split data

A split data test checks that the effect found is not an artifact of the precise sequence of recorded data. Therefore, the relevant data set was divided randomly into two samples. If there is a non-random effect in the data it will be present in both data sets. Two empty data samples were generated for the data split. A pseudo random function with current time as a random seed returned a number between 0 and 1 for every data split. If the pseudo random number was > 0.5, data were saved in sample #1, otherwise in sample #2. In this way, we obtained two samples which are independent of each other. The window width of the sliding window function was set to 36.6°, which is similar to the range of the full moon interval defined by Radin. Both samples were correlated with the GMF ‘ap’-index data set. For both data sets we ran the sliding window function across each data set in steps of 0.5°, resulting in two rows of 16 average GMF ‘ap’-index data values and 16 corresponding effect size per trial values for every 0.5° step. For this pair of 16 values each, Pearson’s r with N = 16 was computed, so we got 720 Pearson correlation values for one sliding window function test across the whole lunar cycle.

Results

The overall results for the total of 199,632 'for the record' experiments yielded a per trial effect size of .49997 (where 0.5 is expected by chance in this test) which is equivalent to a nonsignificant z score of -0.82. The control runs yielded a per trial effect size of .50038 which is equivalent to a nonsignificant z score of 0.82, and the practice runs yielded a per trial effect size of .50001 which is equivalent to a nonsignificant z score of 0.32. But we have already seen that Radin found a full moon effect in the casino data with a higher payout rate within the days of the full moon, and we can assume that the total payout rate of the casino might not be significantly above the mean chance expectation. Otherwise, casino holders might worry about their future. If Radin's full moon effect is based on MMI, we can expect a similar effect in the Fourmilab Retropsychokinesis data.

Control run and practice data correlation results

A test with randomly split data was executed for the 36.6° full moon interval (161.7° to 198.3°). The control and practice run data yielded non-significant correlation values. For the first control run sample $r(14)$ was -.15, and for the second sample $r(14)$ was -.09. For the first practice data sample $r(14)$ was .01, and for the second sample $r(14)$ was .13. Thus, we might assume that there is no periodical bias in the data which could generate the full moon effect found in the MMI data. Figure 3 shows the results for the control run data.

The control runs showed a random walk of the curves. No full moon effect and no other coherent effects are visible in this figure. This seems to indicate that the HotBits hardware random number generator is working well for our purposes here.

MMI 'for the record' data correlation results

The test with randomly split data yielded the highest correlation value for MMI data. The first sample data yielded $r(14) = -.62$ with $p = .005$, one-tailed, and the second sample data yielded $r(14) = -.54$ with $p = .015$, one-tailed. Both datasets showed strong negative correlations which might indicate that there is a non-random trend in the data. Figure 4 shows the results for the MMI 'for the record' data. By visual inspection, both curves showed a similar peak in the full moon interval which reached significance. This might indicate that there is a non-random trend in both datasets which is lunar phase dependent.

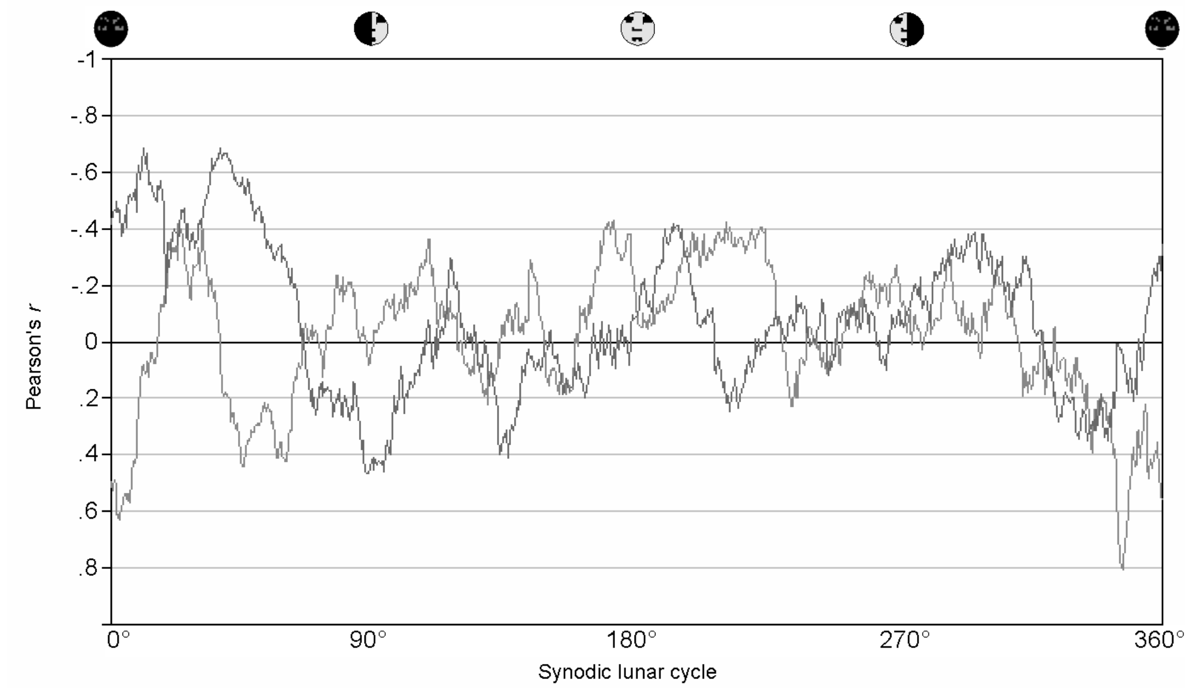

Figure 3. Smoothed epoch analysis for the split control run data vs. GMF 'ap'-index data. Data set A: grey line; data set B: black line.

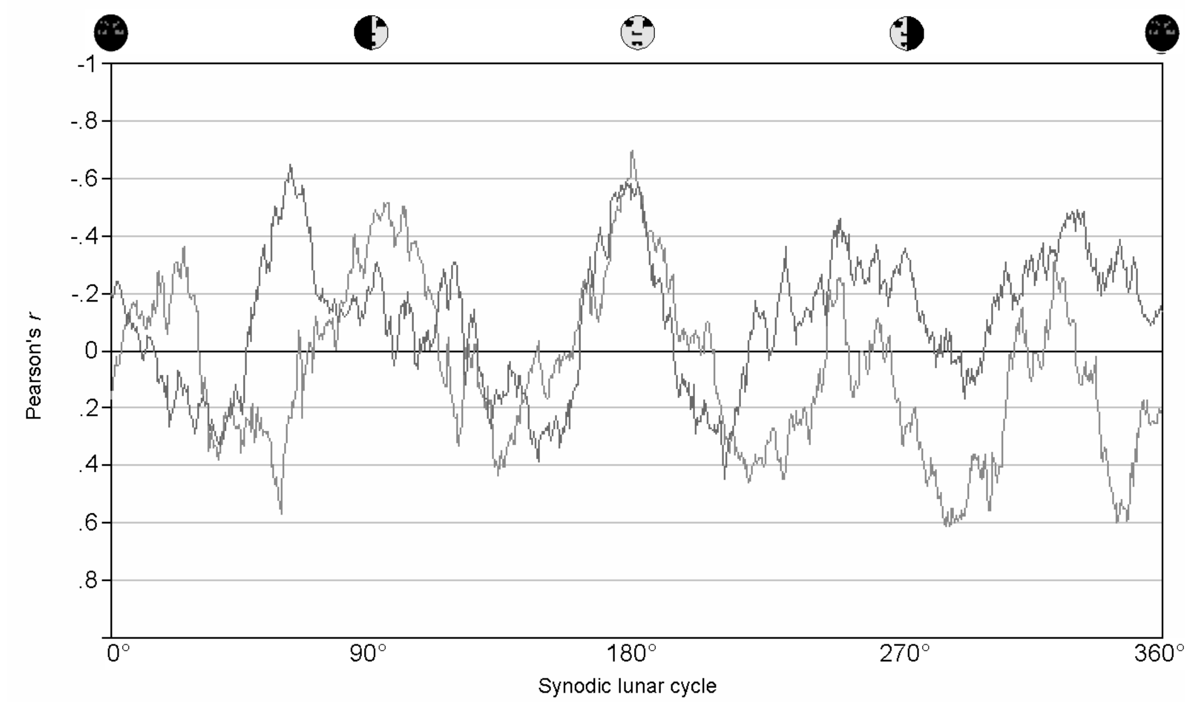

Figure 4. Smoothed epoch analysis for the split MMI 'for the record' experiment data vs. GMF 'ap'-index data. Data set A: grey line; data set B: black line.

Correlation results of non-split data & with different scanning window widths

We wished to plot the shape of the full moon effect and therefore the entire non-split MMI database was scanned with different sliding window widths of 25°, 30°, 35°, 40°, 45°, and 50°, starting at 0° through 360°, moving in steps of 0.5° for each correlation value. Figure 5 shows the results:

We found a sharply-defined full moon correlation effect which is visible for all scanning window widths. The peak effect was found at 3.5° before full moon with $r(14) = .804$ and 40° window width. The shape of the full moon peak resembled an imprint of Earth's magnetotail in the correlation data. A comparison with other Moon phase intervals showed that this strong negative correlation only exists for the full moon interval.

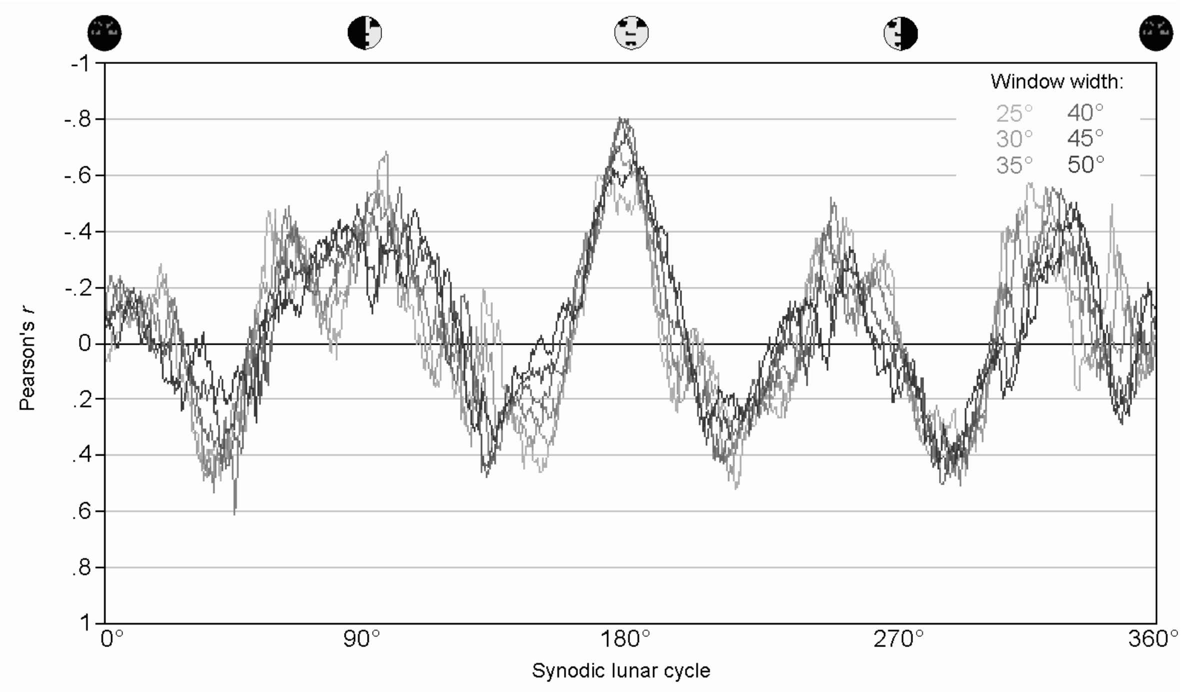

Figure 5. Epoch analysis for the retro-PK 'for the record' experiment data vs. GMF 'ap'-index data with different scanning window widths.

Table 1 lists the correlation values of the full moon MMI data for different window widths, centered at full moon and for comparison, the correlation values for the remaining non-full moon data.

Table 1. Pearson Correlation values for 180° lunar phase (full moon) and the remaining non-full moon data with $n = 16$.

Window width	Pearson correlation of full moon data	Pearson correlation of non-full moon data
25°	-.46*	-.030
30°	-.59**	-.026
35°	-.69**	-.008
40°	-.76***	.008
45°	-.69**	.008
50°	-.62**	.066

* $p < .05$; ** $p < .01$; *** $p < .001$ (all probabilities one-tailed)

All MMI data of the full moon intervals yielded significant results. For Radin's exact full moon interval of 161.7° to 198.3° lunar phase, we got $r(14) = -.74$ with $p = .0005$, one-tailed due to Radin's prediction of a negative correlation. The subset with the lowest average GMF 'ap'-index data value of 8.41 yielded a MMI per trial effect size of .5008 with a standard error of .00043, and the subset with the highest average GMF 'ap'-index data value of 29.1 yielded a MMI per trial effect size of .4993 with a standard error of .0004.

With a window width of 25° we found the initial point of the full moon correlation effect at 153° lunar phase and the end point at 198° lunar phase. With a window width of 50°, the initial point is at the position of 155° lunar phase and the end of the full moon effect at 208° lunar phase. This is the range in which we expect the Moon's transit through the magnetotail of the Earth. The Moon might pass the tail magnetopause between 198° and 208° (mean = 203°) and between 153° and 155° (mean = 154°) lunar phase, based on the observations here. The resulting average width of the Earth's magnetotail in the lunar orbit might be 49° lunar phase or a time interval of 4 days.

The center of the magnetotail in the lunar orbit might not be the exact full moon time, but 6 hours and 53 minutes before the exact full moon time. This might be in accordance with the expected shape of Earth's magnetotail due to the fact that the magnetotail is blown over by the interplanetary magnetic field.

Discussion

The tests in the current study seem to confirm previous observations of MMI-lunar relationship dependent on geomagnetic activity. If we assume that medical treatment such as distant healing or anomalous healing depend on MMI, then we may expect that these medical treatments might also be modulated by lunar-GMF effects, especially at full moon times of low GMF activity. But this is contrary to other findings. For example, Palmer, Baumann and Simmonds (2006) studied the magnetic influence on MMI effects whilst influencing the hemolysis of red blood cells, and wrote with respect to their study: "The most sobering implication of our data ... derives from the evidence of hemolysis acceleration. Translated into healing terms, this means that healers could unintentionally 'mis-direct' their PK to make an illness worse rather than better. ... If the finding with the Ap index continues to hold up, it may suggest that healing should be performed on a day following that when the global GMF is relatively high." The findings in the current study suggest that this statement is too general. The actual situation seems to be more complex. Healers might perform better on days of low GMF activity in full moon times with deep plasmasheet encounters. But if they try to heal at full moon times of extreme high GMF activity, they could make an illness worse rather than better because MMI might be active, but working against their intention.

An important observation in this analysis might be the difference between MMI 'for the record' data and the practice data for the full moon interval. While a remarkable full moon effect was found in the MMI 'for the record' data, it is completely absent in the practice run data. Due to the fact that practice and MMI 'for the record' data were taken from the same random source, one might assume that the difference might be due merely to psychological factors. The missing full moon effect in the practice data might indicate that a non-serious attempt to "influence" the output of the RNG might fail to produce a full moon effect. It might be dependent on the strength or gravity of intent. Practice alone does not yield a result. Translated into healing terms, this means that praying, wishing and healing without a serious intent might not yield a result.

Another point is the accurate shape of the full-Moon effect. We don't know what happens when the Moon is passing through the magnetotail but we may assume that a physical parameter is influenced which has a strong effect on the human mind to influence matter without the use of any currently known type of physical mechanisms. The current findings suggest that MMI might not be an elusive and weak effect but rather a stronger and more reliable effect if we knew the crucial parameters and could apply them systematically in MMI research.

We also do not understand the exact structure of Earth's farther magnetosphere. What we have are reconstructions and theoretical models of the geomagnetic field as observed by spacecraft data (Tsyganenko, 1995). These spacecraft are located at a distance of 3 to 40 Earth radii maximum (Tsyganenko and Sitnov, 2007). If the sources of this MMI effect observed here are based upon interactions of the Moon with the Earth's magnetotail, then we have a well-formed imprint of the farther magnetosphere which, beyond the use of expensive spacecraft, give us empirical clarification about the location of the magnetopause and the shape of the farther magnetotail at a distance of about 60 Earth radii. It seems to be unique in parapsychological research that an unusual MMI effect might be able to operate as a low cost probe for geomagnetic tail research.

While the casino data in the Radin study were generated at the same time and in the same location where they had been "treated", the MMI data had already been generated at an unknown time before being used in the Fourmilab RetroPsychokinesis Project. They were delayed for hours, days, or perhaps weeks, and they were generated far away from the participants' location. In both cases, we noticed an unusual effect, phase locked with the synodic lunar phase. If the retroactive psychokinesis effect really exists (Schmidt, 1976) – and the lack of any reverse effect in control and practice data support this assumption – we would not expect an effect in the parts of the lunar phase where the random data had been generated beforehand, but in this part of the lunar phase where the test persons observe the data in the MMI experiments. This was exactly what we had found. This observation might provide evidence of an ability of the human consciousness to influence targets distributed in space and time without being limited by the constraints of the local bodily presence (Schmidt, 1981).

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