Boundary Institute

A dog that seems to know when his owner is coming home: Effects of geomagnetism and local sidereal time

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In a series of observations from 1994 through 1997, Rupert Sheldrake and Pamela Smart tested whether Smart's male terrier dog, Jaytee, could correctly anticipate when she was returning home. Jaytee's anticipatory behavior proved to be significantly accurate, even under double-blind conditions in which a distant experimenter informed Smart to return home at randomly determined times via a pager. Overall, the success of these experiments suggests that Jaytee and Smart shared a strong telepathic bond, or perhaps that Jaytee possessed precognitive skills. However, while Jaytee's performance was remarkably accurate most of the time, in a minority of cases he completely failed to anticipate Smart's return. This paper presents evidence indicating that Jaytee's anticipatory accuracy significantly improved on calm geomagnetic days, and that the performance-GMF relationship was strongly influenced by local sidereal time.

INTRODUCTION

In the course of everyday life, Pamela Smart of Ramsbottom, Bury, England, left her home at various times throughout the day and evening, and for various lengths of time. While she was away, her parents would watch after her male terrier dog, named "Jaytee," with whom Smart shared a deep emotional bond. Over a period of years, Smart's parents noticed that Jaytee adopted a characteristic waiting behavior near the front window shortly before Smart arrived home. As part of a program of testing unusual abilities of animals, Rupert Sheldrake proposed to test Jaytee's purported abilities in a systematic way (Sheldrake, 1999; Sheldrake & Smart, 1998, in press a, b).

Journey/Response Tests

In early tests, when Smart decided to return home she recorded the time, and then again recorded the time upon arriving home. The difference was called Smart's "journey time" (J). Meanwhile, when Jaytee adopted his characteristic waiting behavior, Smart's parents also recorded the time. The time the dog waited at the window until Smart's actual return was called Jaytee's "response time" (R). Neither Jaytee nor Smart's parents could predict when she would return, as she was unemployed at the time and did not keep a regular schedule.

If Jaytee could indeed sense Smart's intention to return, then there should have been a positive correlation between the times R and J. That is, say that from the time Smart intended to go home, to her arrival, was 15 minutes. If Jaytee was observed to adopt his characteristic waiting at the window for 15 minutes before Smart arrived home, then this could be taken as evidence (i.e., one data point in a series of repeated tests) that Jaytee correctly sensed Smart's intentions, even when she was miles away and without her parents knowing when she was going to return.

Sheldrake and Smart (1998) reported that the R vs. J correlation over 62 occasions observed throughout 1994 and 1995 was $r = 0.625$, $p < 10^{-7}$, as shown in Figure 1. They discussed in detail why they believed this correlation could not be explained by intentional or inadvertent cueing from the parents, or by Jaytee's or Smart's habits related to time of day, or from external sensory cues.

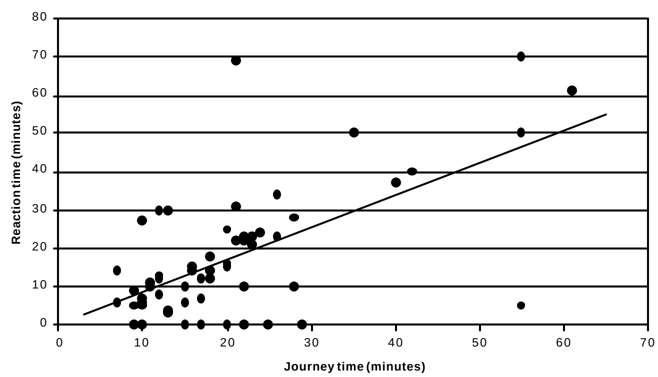

Figure 1. Relationship between joumey time and Jaytee's response time (data courtesy of Rupert Sheldrake).

Video taped tests

Given the success of these informal observational studies, Sheldrake and Smart (in press a, b; Sheldrake, 1999) followed up their initial observations with a series of 45 new experiments conducted from 1995 through 1997. In these studies, Jaytee's behavior was continuously video-taped while Smart was out of the house, and the video records were later used by independent judges to reconstruct the amount of time that Jaytee spent at the window. These experiments included 30 sessions in which Smart spontaneously decided when she would return home, 12 sessions in which distant experimenters signaled her (via a pager) to return home at a randomly determined time, and 3 sessions conducted by investigators skeptical of Jaytee's reported abilities (Wiseman, Smith & Milton, 1998).

In these studies the hypothesis was that Jaytee would spend little or no systematic waiting time at the front window until Smart intended to return home, then he would wait there until she returned. To assess the results of these sessions, the independent judges were asked to record the number of seconds in blocks of 10 minutes that Jaytee waited at the front window, for all 10-minute blocks in each experiment. The average waiting times are shown in Figure 2 for experiments of 80, 110 and 180 minutes in length.

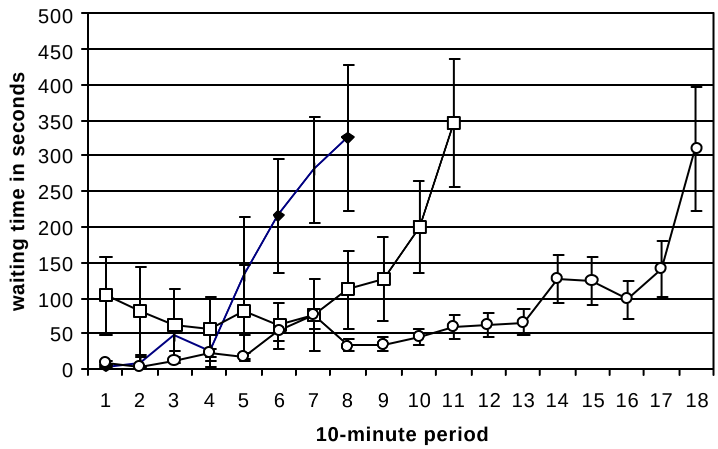

Figure 2. Average number of seconds (and one-standard error bars) that Jaytee waited in front of the window per 10-minute period in eight 80-minute, nine 110-minute and thirteen 180-minute experiments.

Sheldrake and Smart discussed possible alternative explanations for these results, including behavioral cues from the humans, subliminal sensory cues, and human or dog habits, but rejected the alternatives in favor of a genuine anomaly, possibly a telepathic bond. They further noted that results obtained in 12 sessions using double-blind, randomly-determined return times, and in 3 sessions with skeptical observers, closely resembled the results obtained in sessions where Smart decided herself when to return home.

These results could not be explained as Jaytee simply increasing his waiting time over the course of the day until Smart's return, because as seen in Figure 2, the data shows a fast rise in waiting times in the periods just before she returned, dependent on the length of the experiment. In addition, in a series of 45 control studies where Smart did not return home the same day, Jaytee's waiting time did not show an increase (Sheldrake, 1999).

While the results of these and the earlier experiments provide robust evidence for a non-local connection between dog and human, Sheldrake and Smart also noted that Jaytee did not always correctly anticipate Smart's return home. They speculated that some of the failed sessions may have been due to periods when Jaytee was feeling ill, or distracted by neighborhood cats, or sleeping, or hiding from Smart's father (whom Jaytee was afraid of). These are plausible explanations, but there may be others.

Psi and the Geomagnetic Field

A growing number of studies have suggested that the Earth's naturally fluctuating geomagnetic field (GMF) affects both animal physiology (Olcese et al, 1988; Stehle et al, 1988; Thomas et al, 1986) and human behavior (e.g., Braud & Dennis, 1989; Ganjavi et al, 1985; Lukacova & Tunyi, 1988; Persinger, 1987b, 1991; Persinger & Levesque, 1983; Persinger & Nolan, 1984; Radin, 1996a; Roney-Dougal & Vogl, 1993).

Of particular interest here is evidence indicating that the accuracy of psi perception in humans increases during days of small changes in GMF and decreases during days of large changes in GMF. While the underlying mechanisms for this correlation are not well understood, the correlation has been observed in both a growing number of controlled laboratory experiments and in studies of spontaneous psi experiences (e.g., Adams, 1986, 1987; Arango & Persinger, 1988; Berger & Persinger, 1991; Haraldsson & Gissurarson, 1987; Lewicki, Schaut & Persinger, 1987a; Makarec & Persinger, 1987; Persinger & Schaut, 1988; Persinger, 1985, 1987; Persinger & Krippner, 1989; Radin, McAlpine & Cunningham, 1994; Radin, 1992, 1993, 1996b; Schaut & Persinger, 1985; Spottiswoode, 1990; Wilkinson & Gauld, 1993).

Beyond the psi-GMF correlation in humans, it is known that the GMF is also associated with orientation and navigation skills in animals (Mather & Baker, 1980; Presti & Pettigrew, 1980), and that some animals – including dogs – are particularly adept at navigation, tracking and orientation. We may speculate that if Jaytee's ability is akin to a "nonlocal" orientation skill, then perhaps those abilities are disrupted during geomagnetically stormy days, as they are in say, homing pigeons. If so, then Jaytee's distant orientation behavior would be suppressed during days with high GMF flux. This is what the present analysis investigated.

Local Sidereal Time

A possible modulating effect on psi effect sizes, and the psi-GMF correlation (r_{GMF}), was recently reported by Spottiswoode (1997a, b) and Spottiswoode and May (1997). Their analyses were based on 2,879 remote viewing and ganzfeld telepathy experiments conducted between 1976 to 1996. Besides observing a strong local sidereal time (LST)-dependence on psi effect sizes, they also observed that the r_{GMF} correlation varied by LST. In both cases, the most pronounced effect was between 12:00 and 14:00 LST, peaking around 13:00 LST. Most of the positive psi effects, and most of the negative r_{GMF} correlations occurred around this time. To see if this same relationship might hold for the present experiments, we examined the r_{GMF}–LST relationship for the 45 video-taped experiments.

ANALYSES

Geomagnetic Index

The geomagnetic index used in this study is the A_p index, a 3-hour planetary-wide index of GMF flux. Daily average A_p values were retrieved from the World Data Center's Solar Terrestrial Physics database, which is linked to the United States' National Oceanic and Atmospheric Administration's web site.[1] Throughout this analysis, the natural log of the daily A_p was used rather than raw A_p values, as A_p values tend to be negatively skewed.

Journey/Response Experiments

Using **j** = journey time and **r** = response time in each experiment, Jaytee's performance was measured as $\mathbf{p}_{jr} = 1 - [|(\mathbf{r}-\mathbf{j})|/(\mathbf{r}+\mathbf{j})]$. This value is conveniently between 0 to 1, with

[1] http://www.ngdc.noaa.gov/stp/stp.html

values near 0 indicating a poor match between journey and response times, and values near 1 indicating an excellent match. A negative correlation was predicted between $\mathbf{p}_{jr}$ and $\ln(A_p)$. We refer to this correlation as r_{GMF}, and p-values are reported one-tailed.

Video Experiments

If Jaytee was able to sense when Smart was about to return home, and if he adopted his characteristic waiting behavior only in anticipation of greeting his human companion, then the waiting time for all 10-minute periods prior to Smart's return should be zero, and the 10-minute period of her return should be some number greater than zero. However, because of many uncontrolled elements in Jaytee's actual environment, including times when Jaytee simply wished to look out the front window, we relax the ideal expectation by using a quadratic (2^{nd} order power) curve as a nonlinear estimate of waiting time. That is, for our measure of Jaytee's performance per experiment, a correlation was determined between Jaytee's waiting time per 10-minute period (call this $\mathbf{W}_i$) and the square of the number of the period (say, $\mathbf{i}^2$**,** where **i** is the number of the period). Thus, in an experiment of 80 minutes duration, the correlation was determined between the pairs (W_1, 1), (W_2, 4) … (W_8, 64). Let's call this correlation r_p ("p" for performance).

To be especially conservative, r_p was evaluated for **i**-1 periods. This meant that r_p was based on Jaytee's waiting time from the beginning of the experiment to 10 minutes *before* the period in which Smart actually began to return home. This eliminated the most likely alternative explanation for Jaytee's behavior, namely that he was able to detect sensory cues that he had learned to associate with Smart's return. While it may seem inconceivable that Jaytee could physically sense (through the ordinary senses) his human companion returning home from 10 minutes away, especially through all the noise generated by city traffic, the perceptual capabilities of some animals are hundreds to thousands of times more sensitive than those enjoyed by humans.

Thus, to be prudent we exclude the possibility that Jaytee was able to physically sense Smart's return trip by only using waiting time data up to the 10-minute period before Smart began to return home.[2] The null hypothesis predicts no systematic relationship between r_p and $\ln(A_p)$. The alternative hypothesis predicts a negative correlation, so we use one-tailed p-values.

Local Sidereal Time

Remote viewing and ganzfeld telepathy experiments are typically from 20 to 45 minutes in length. In contrast, the video-taped experiments with Jaytee were one to three *hours* in length. As a result, because the LST analysis requires a single moment in time associated

[2] This would seem to shift a psi explanation from telepathy to precognition, but it is also likely that Smart's intention to return home was formed before she actually started to leave. In any case, no attempt is made here to distinguish what underlying psi "mechanism" may be responsible for Jaytee's behavior.

with each experiment, we decided to assign LST from each experiment's mid-point.[3] Thus, for an 80-minute experiment, we used the value of LST at the 40 minute mark.

In addition, because there were only 45 experiments available for analysis[4], and because those studies did not distribute uniformly across the 24-hours of LST per day, the r_{GMF} correlations for this analysis were based on a sliding window of length 9 (i.e., 9 pairs of r_p vs. ln(Ap), sorted by closest LST times), and the LST value used for each resulting correlation was the average of the associated 9 LST values.

RESULTS

Journey/Response Experiments

For all 62 Journey/Response experiments, r_{GMF} = -0.05, N = 62, p = 0.36 (one-tail). This correlation is in the predicted direction, but is non-significant. To examine this relationship more closely, the same r_{GMF} correlation was calculated as though each experiment had taken place one day before the actual experiment, then one day after, then two days before, and so on, up to –15 and +15 days. We will refer to these time-offset correlations as $r_{GMF(0)}$, $r_{GMF(-1)}$, $r_{GMF(+1)}$, and so on. Figure 3 shows the resulting 31 r_{GMF} values, and Figure 4 shows the likelihood of these values in terms of odds against chance. This analysis indicates a suggestive pattern, in which the most negative correlation occurs at $r_{GMF(-1)}$, but that correlation is not significant either.

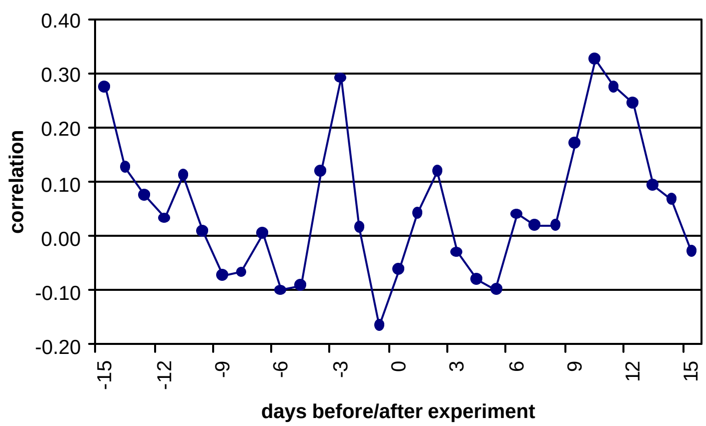

Figure 3. Correlation between p_{jr} and $\ln(A_p)$ for the day of the experiments (day 0) and plus and minus 15 days.

[3] The times at which Smart began to return home in each experiment were kindly provided by Rupert Sheldrake.
[4] Times were not available for the Journey/Response experiments.

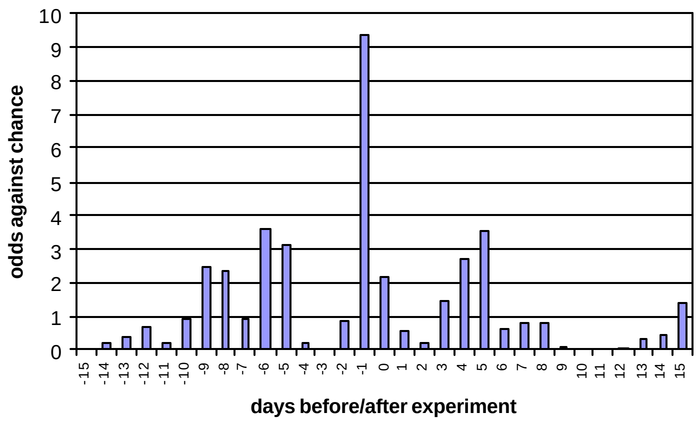

Figure 4. Odds against chance for the correlations shown in Figure 3, one-tailed.

> residual

Video Experiments

Analysis of the video taped experiments resulted in $r_{GMF(0)} = -0.447$, $N = 45$, $p = 0.001$, as shown in Figure 5. Data used in this analysis are listed in Appendix Table 1.

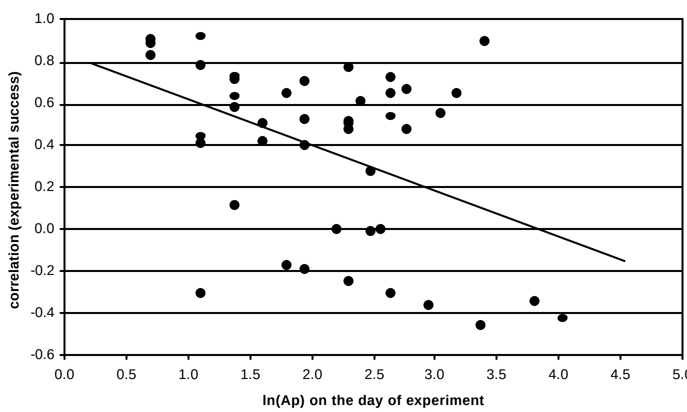

Figure 5. r_{GMF}, the correlation between r_p and ln(Ap) on the day of the experiment.

Figure 6 shows the same correlations 15 days before and after the day of the experiment, and Figure 7 shows the likelihood of these values. After Bonferroni correction for multiple tests, r_{GMF} on the day of the experiment was the only significant correlation. This provides strong support of previous observations reporting a negative psi-GMF relationship.

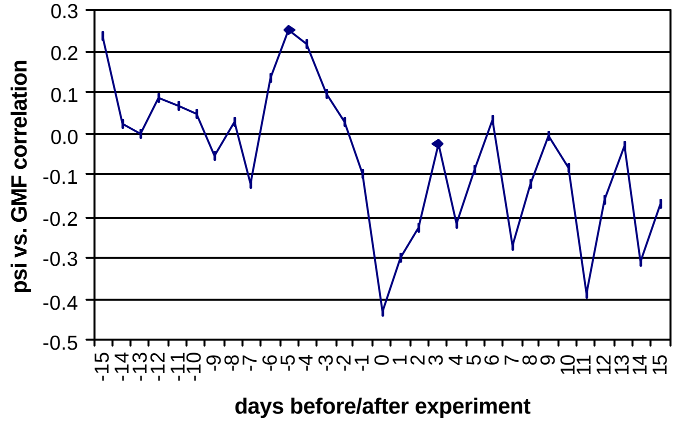

Figure 6. r_{GMF} for the day of the experiments and plus and minus 15 days.

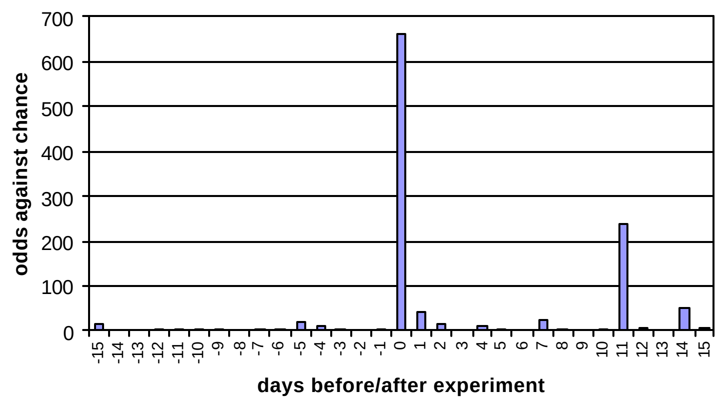

Figure 7. One-tailed odds against change for the correlations shown in Figure 6.

Local Sidereal Time

Analysis of the $r_{GMF(0)}$ vs. LST relationship is shown in Figure 8, and the odds against chance for these correlations are shown in Figure 9. These results resemble Spottiswoode's (1997a) findings in that the strongest negative correlation is observed between 12:00 and 14:00 hours, with a minimum around 13:00 LST. Figure 9 indicates that even though it is based on only 9 datapoints, the $r_{GMF(0)}$ correlation is significantly negative around 13:00 LST.

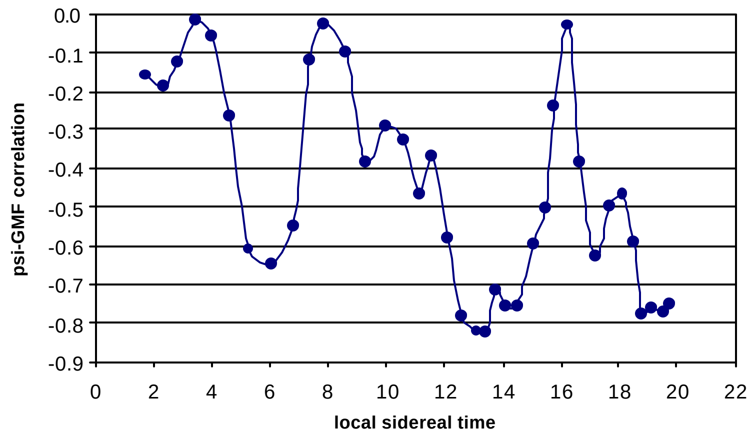

Figure 8. GMF vs. psi correlation across local sidereal time.

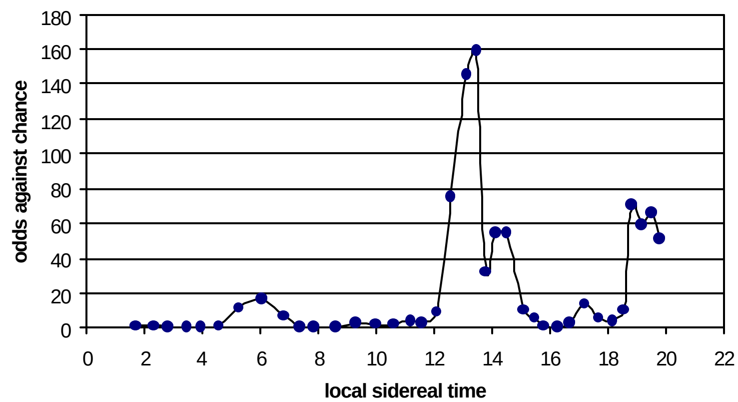

Figure 9. Odds against chance (one-tailed) for the correlations shown in Figure 8.

DISCUSSION

Of the two series of studies involving Jaytee and Smart, both provided $r_{GMF(0)}$ outcomes in the predicted direction. The correlation in the first study was non-significant, but it may be meaningful that $r_{GMF(-1)}$ was the most negative within ±15 days of the experiment. The $r_{GMF(0)}$ correlation in the second study was significantly in accordance with previous observations.

The problem posed by these results is that the electromagnetic fields generated by television sets and other electronic equipment commonly found in houses are hundreds to thousands of times stronger than the natural fluctuations in the Earth's geomagnetic field. Until recently, it was assumed that the amount of energy absorbed by living organisms by Earth-strength magnetic field fluctuations was too weak to affect biology at the cellular level, to say nothing of the behavioral level (e.g., Adair, 1991). Nevertheless a growing bioelectromagnetics literature continues to suggest that tiny variations in GMF are associated with everything from cellular to behavioral changes in a wide range of living organisms (Barinaga, 1992; Becker, 1990).

In this particular case, it is clear that Jaytee's performance suffered on days with higher GMF flux, at least for the video taped experiments. The percentage of variance accounted for in that study is non-trivial: 18%. What this means is that if Jaytee had happened to be tested on the 22 days with the calmest GMF, his average performance measured by r_p would have been $r_p = 0.509$. And if he had been tested on the 22 noisiest GMF days, then $r_p = 0.248$. The difference in r_p is significant ($p = 0.019$, one-tailed). Whether these results ultimately indicate that the "carrier" of anticipatory information is influenced by electromagnetism, or more likely that the nervous system is influenced by certain magnitudes and frequencies of geomagnetic flux, remains to be seen.

Although the present LST analysis resembles the findings of Spottiswoode and May, we must keep in mind that it is based on a small number of datapoints, and the points shown in Figure 8 are not independent because they were calculated with a sliding window. In addition, there were a number of arbitrary decisions that may influence the interpretation of these results. This includes the definition of the appropriate LST time as the mid-point of each experiment, and the use of a 9-point sliding window to calculate r_{GMF}. With these caveats in mind, I believe that the present results support more detailed investigations of an LST relationship with geomagnetic-psi correlations in both humans and animals.

As a speculation, it may be that an organism's orientation ability, which is used to locate objects in space, may have an psi analog. That is, psi orientation would enable an organism to locate objects not just in space, but also in space-time. And if psi orientation shares the same cortical and nervous system processes as ordinary orientation skills, which may rely upon weak interactions of geomagnetic fields with say, ferromagnetic crystals within neurons, then external magnetic interference via high GMF flux would also disrupt psi performance.

This idea can be tested by conducting psi tests with animals known to have exceptionally good orientation skills, like homing pigeons, and subjecting them to varying magnetic fields. In addition, it suggests that persons who show high psi abilities might also be unusually good at more conventional orientation tasks. It might be interesting, for example, to see if there is a positive correlation between a person's psi ability and his or her ability to point in the direction of their home without benefit of external orientation clues (e.g., after being blind-folded and spun around several times).

CONCLUSION

Analysis of the relationship between daily geomagnetic field fluctuations and a dog's apparent telepathic bond with his human companion supports previous observations indicating that geomagnetic field flux on, or just before the day of an experiment, modulates psi abilities to a significant degree. Further analysis suggests that this modulation may be significantly affected by local sidereal time.

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APPENDIX: DATA FROM 45 VIDEO TAPED EXPERIMENTS

Date	Time Smart left for home	ln(Ap)	r_p	10-minute periods	Description
05/07/95	2115	3.18	0.7	18	Smart self-report
05/16/95	2215	3.81	-0.3	18	Smart self-report
05/22/95	2000	1.79	-0.2	11	Smart self-report
05/29/95	2043	1.95	0.7	11	Smart self-report
05/31/95	1924	3.40	0.9	11	Smart self-report
06/12/95	2100	1.10	0.4	16	Wiseman et al
06/13/95	1418	0.69	0.8	13	Wiseman et al
06/19/95	2120	3.37	-0.5	18	Smart self-report
06/27/95	2136	1.79	0.6	18	Smart self-report
07/04/95	2154	1.95	0.5	18	Smart self-report
07/13/95	2129	1.61	0.5	18	Smart self-report
07/18/95	2136	2.30	0.5	18	Smart self-report
08/15/95	2148	2.64	0.5	8	Smart self-report
08/30/95	2132	1.39	0.6	18	Smart self-report
09/10/95	2052	2.48	0.3	18	Smart self-report
09/18/95	2113	1.10	0.4	11	Smart self-report
09/29/95	1128	1.10	0.9	8	Smart self-report
10/04/95	2114	4.04	-0.4	11	Smart self-report
10/10/95	2158	2.30	0.5	18	Smart self-report
10/16/95	2136	1.95	0.4	18	Smart self-report
11/13/95	2130	1.39	0.7	11	Smart self-report
11/20/95	2042	1.39	0.1	11	Smart self-report
11/24/95	1123	0.69	0.9	8	Smart self-report
12/04/95	2139	2.77	0.7	10	Wiseman et al
12/13/95	1520	0.69	0.9	8	Smart self-report
12/20/95	1129	1.39	0.7	8	Smart self-report
01/08/96	2050	1.39	0.6	11	Smart self-report
01/19/96	1122	2.30	0.8	8	Smart self-report
01/31/96	2111	2.30	-0.2	11	Smart self-report
02/07/96	2053	1.95	-0.2	18	Smart self-report

02/27/96	1205	2.64	0.6	18	Smart self-report
03/18/96	2039	2.20	0.0	8	Smart self-report
07/16/96	1121	1.61	0.4	8	Smart self-report
11/19/96	2105	2.30	0.5	17	random bleep
12/11/96	2107	2.64	-0.3	16	random bleep
02/11/97	2104	3.04	0.6	15	random bleep
03/19/97	1504	1.10	-0.3	13	random bleep
03/25/97	2009	2.48	0.0	13	random bleep
05/07/97	1420	1.10	0.8	12	random bleep
07/01/97	2020	1.39	0.7	12	random bleep
07/09/97	2106	2.40	0.6	17	random bleep
08/29/97	2150	2.56	0.0	17	random bleep
09/10/97	2139	2.94	-0.4	12	random bleep
09/21/97	2120	2.77	0.5	16	random bleep
10/08/97	1536	2.64	0.7	15	random bleep

Table 1. Date, time at which Smart left to return home, ln(Ap), correlation measure of Jaytee's success, number of 10-minute periods, and description for the 45 video taped experiments.