THE RELATIONSHIP BETWEEN LOCAL GEOMAGNETIC ACTIVITY AND PSYCHIC AWARENESS

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ABSTRACT: There is evidence that psychic experiences are related to geomagnetic activity (GMA). However, sometimes these are related with higher, and sometimes with lower, GMA. This anomaly may be clarified by studying local GMA. In order to explore this, a 4-year investigation was conducted. Unfortunately, solar activity and GMA were at their lowest for 100 years, so it was necessary to combine the preliminary and follow-up study data. Both studies used the same free-response design. The 26 participants, all of whom resided at, or near, Samye Ling Tibetan Centre, had practiced meditation for at least 10 years. Each participant completed a minimum of eight sessions each year. Three questionnaires and one psychological test were completed. Geomagnetic measurements were supplied by the British Geological Survey's observatory located near Samye Ling. There was no difference between sessions conducted during high or low band 1, or high or low band 3 GMA, but post-hoc analyses suggested a band 3 GMA effect. Overall, males' psi scores were significantly negative (p = .02, two-tailed), whereas females scored at chance; the difference was significant (p = .03). The participants with the highest temporal lobe questionnaire scores showed the strongest correlation of psi with GMA (p = .06).

Keywords: local geomagnetic activity, precognition, temporal lobe experiences questionnaire (TLEQ), season

The Link Between Psi and Geomagnetic Activity (GMA)

GMA is the aggregate of disturbances in the natural magnetic field surrounding the Earth, caused by the interaction of that field with plasma (electrically charged gas) ejected from the Sun during solar storms. For the past three decades research in parapsychology has found evidence that psychic experiences may be affected by fluctuations in the geomagnetic field, that is, geomagnetic activity (GMA). For a detailed review of the literature see Roney-Dougal, Ryan, and Luke (2013).

Receptive psi studies have found that, in general, psi scoring was greater during periods of low GMA as measured by the global indices (e.g., Krippner & Persinger, 1996; Persinger & Krippner, 1989). Occasionally, however, the opposite is reported (e.g., Radin, McAlpine, & Cunningham, 1994). Hubbard and May (1987) criticized research into the psi-GMA link for relying on global GMA measurements and urged that local measurements be made.

In a meta-analysis of 51 studies comprising 2,879 free-response trials, Spottiswoode (1997a) found that the correlation of psi with global GMA was much stronger in a 2-hr window centered close to the local sidereal time (LST) effect size peak. Dalkvist and Westerlund (2000) suggested that Spottiswoode's findings could be explained if performance was affected by a factor that varied by an interaction of time of day and time of year. Ryan (2008) noted that as the large majority of ESP experiments in Spottiswoode's database were carried out during the daytime, an influencing factor with seasonal variation would generate a systematic variation of psi effect by LST. The trials in Spottiswoode's database did indeed exhibit a seasonal variation of psi effect (Sturrock & Spottiswoode, 2007). Ryan (2008) identified geomagnetic pulsations as a candidate for the underlying factor; these regular fluctuations in the geomagnetic field are the components that make up local GMA. They are classified into five bands according to frequency (i.e., the number of waves per second) and character (regular sinusoidal or irregular; Campbell, 2003; Jacobs, 1970), and each type exhibits distinct seasonal and/or interacting seasonal/daily variation (Jacobs, 1970). Pulsation strength and frequency tend to be related; in other words, pulsations at the lower end of the frequency spectrum tend to be the strongest.

Ryan (2008) studied the relationship between local geomagnetic pulsations and the results of 343 ganzfeld and remote viewing sessions and found that psi effect size did indeed vary by pulsation frequency. Ryan suggested

that these results may explain the inconsistent relationship between psi and GMA. He found that low frequency band 3 (0.025–0.1 Hz) geomagnetic pulsations were in general associated with poor psi performance (a finding further supported by Ryan and Subbotsky, 2010), whereas higher frequency band 1 (0.2–0.5 Hz) pulsations were associated with enhanced psi performance. The positive correlation between ESP and high frequency band 1 activity is a new finding. Local band 1 activity generally is not correlated with *ap* but in some years it is positively correlated with it. Low frequency band 3 disturbances correlate with the global GMA index and it is this aspect that relates to the correlations previous studies have found. However, there have been occasions where the general finding of negative correlation of psi with global GMA has been reversed and the high frequency band 1 component could well be implicated here, as Ryan (2008) found psi scoring related to enhanced band 1 activity. Ryan (2008) also suggested that an apparent association of specific frequencies of geomagnetic pulsations with psi may explain the relationships between LST, GMA, and psi performance reported by Spottiswoode (1997a, 1997b). Geomagnetic pulsations exhibit seasonal variation and will therefore be distributed unevenly across LST, due to the fact that psi trials have been mostly conducted in the daytime.

Research also suggests that there may be a lunar effect on psi (Etzold, 2005; Radin & Rebman, 1994, 1998; Sturrock & Spottiswoode, 2007). There is evidence from the geophysics literature that the moon affects GMA via tidal/gravitational effects (Fraser-Smith, 1982; Stenning, Carmody, & Du, 2002), although these small effects would seem to be insufficient to explain the relationships between lunar phase and psi that have been observed. A problem in this area is the potential for solar rotation to confound lunar analyses, as the lunar synodic month (29.5 days) is close to the synodic period of solar rotation (between 25 and 30 days, depending on solar latitude).

To look at individual differences related to GMA and psi scoring, we had our participants complete the Temporal Lobe Experience Questionnaire (TLEQ). This questionnaire addresses various different aspects of response to phenomena which may be related to disturbances in the temporal lobe. Neppe (1984) and Cook and Persinger (2001) suggested that GMA may affect the temporal lobes and that people who experience temporal lobe symptomatology may also have spontaneous and laboratory psi-type experiences. In other words, sensitivity to GMA may be correlated with temporal lobe symptomatology and increased psi experiences.

Because we were working with meditators we were interested in attempting to assess the degree to which meditation affected psi scoring. It is very tricky to assess the degree to which the practice of meditation alters a person. The Freiburg Mindfulness Inventory (FMI; Walach, Buchheld, Buttenmuller, Kleinknecht, & Schmidt, 2006) is a recent attempt to assess such changes, and so we administered it on a purely exploratory basis. Similarly the Necker cube test (Sauer et al., 2012) was designed to assess the effect of meditation on attention, and so this was used for the same purpose. The final questionnaire was the Meditation Attainment Questionnaire (MAQ) which had been used in previous research (Roney-Dougal & Solfvin, 2006, 2011; Roney-Dougal, Solfvin, & Fox, 2008) in which years of practice had been found to be related to increased psi scoring. Therefore, we once again asked participants to complete this questionnaire. Results from these questionnaires will not be presented in this paper.

Specific Environment

One of the key aims of the project was to replicate and extend the work of Ryan (2008) by exploring the features of local GMA that may modulate performance in receptive psi trials. Measurement of the geomagnetic pulsations that characterize the local geomagnetic environment requires an exceedingly sensitive magnetometer (0.1 nT or better). There are currently five suitable magnetometers in continuous operation within the U.K. One of these magnetometers is located in Eskdalemuir, 2 miles from Samye Ling Kagyu Tibetan monastery, the first Tibetan Buddhist center to be established in the West.

Many cycles are evident in records of GMA: diurnal, solar rotation, lunar, seasonal cycles, and an 11-year solar activity (sunspot) cycle. The latter is by far the most prominent, and so the psi trials were conducted over a 4-year period with the aim that the full range of GMA conditions would be represented. The investigation was split into two studies:

1. The preliminary study to initiate research into diurnal, solar rotation, lunar, and seasonal effects.
2. The formal follow-up study to verify any potential findings from the preliminary study and also to look at the effect of the sunspot cycle, and any other longitudinal findings.

In this paper, results are presented for the preliminary and follow-up studies combined to allow an overall assessment for the whole 4 years, because GMA was at an extremely low level for the entire 4 years.

Hypotheses

Exploration of Psi-Conducive Factors in Local GMA

Formal hypotheses.

1. Psi scoring for sessions conducted during "high" band 3 (band 3 = 0.025–0.1 Hz) GMA will be lower than psi scoring for sessions conducted during "low" band 3 GMA. The "low/high" cut-point (i.e., the threshold at which GMA is regarded as "high") in this hypothesis is as observed in Ryan (2008). The use of this cut-point may be important because there is long-term (i.e., solar cycle) variation in the prevalence of pulsation activity. Thus the proportion of psi sessions in the "high" or "low" categories may depend on the year of experimentation.
2. Band 1 GMA (0.2–0.5 Hz) will be positively correlated with psi scoring. Spearman's test will be used owing to the skewed distribution of GMA values. (Note: In the band 1 frequency range there are considerable variations between the response characteristics of magnetometers at different sites and during different periods. This presents difficulties in establishing the cut-point between "low" and "high" activity. For this reason, the bifurcation of sessions and subsequent *t*-test analysis planned at outset was not possible, and so the correlation hypothesis was used to assess the influence of this band of activity.)

Exploratory hypotheses. Participants' total scores on the TLEQ questionnaire will be correlated: (a) negatively with the correlation between band 3 GMA and psi scoring; and (b) positively with the correlation between band 1 GMA and psi scoring.

Longitudinal analyses were:

1. the overall psi score over time
2. the correlation of GMA with psi score for individuals who had done at least two series of eight sessions. There were some individuals who participated for all four years.

Exploration of Psi-Conducive Factors in Seasonality and Lunar Phase

Exploratory hypotheses. (a) The daily maximum temperature and season of the year would be positively correlated with psi scoring; (b) psi scoring would be related to lunar phase.

Method

Design

A clairvoyance/precognition free-response design was used in which the participant attempted to correctly choose a picture selected at random by computer. The computer programme (PreCOG) chose a target set at random from a pool of 25 sets, and a 1 min video-clip at random from the selected four-video set. PreCOG also pseudo-randomly chose whether the session would be in clairvoyance mode (target chosen at beginning of session) or precognition mode (target chosen after participant had made their choice), such that half the sessions were in each mode. Each participant completed a minimum of eight sessions each year. PreCOG had already been run successfully with monastic communities in India; the sessions could be run without assistants, enabling the experimenter (the first author) to work with the participants at any time that was convenient for them and in the participant's preferred meditation place. Most participants did one session a week at the same time of day, depending on their availability. This design has both a randomized double-blind and inbuilt fraud control, owing to PreCOG randomly choosing the target so that neither experimenter nor participant had any idea which target set was being used. This design

was used here for consistency with previous Indian meditation studies run by the experimenter (Roney-Dougal & Solfvin, 2011).

The preliminary study ran from December 6, 2008 until May 27, 2010. The follow-up study ran from September 14, 2010 until October 4, 2012.

Participants

The participants, who were either residents at Kagyu Samye Ling Tibetan monastery or the local Eskdalemuir village, had practiced meditation for at least 10 years and were practicing Tibetan Buddhist meditation regularly during the period of research. The oldest participant had been practicing for 53 years. Overall, in both the preliminary and follow-up studies, there were 25 participants who contributed 391 sessions. There were a total of 11 male and 14 female participants; one was a monk and two were nuns, the remainder being lay people. Ages ranged from 37–94 years.

A personal meeting with potential participants was arranged, the project described in detail, and an invitation to participate made. Any candidate who volunteered for a minimum of eight sessions was included in the study. Thus an informal consent procedure was used. The monks and nuns also obtained permission from the monastery abbot.

Eleven participants each completed one set of eight sessions, 8 participants completed two sets of eight sessions, 4 participants completed three sets, and 2 completed the maximum possible of four sets, making a total of 376 sessions. To eliminate bias due to optional stopping, extra sessions were excluded from the psi data analyses. In the GMA analyses the primary concern was not each individual's performance, therefore optional stopping is irrelevant. For the purpose of the GMA and longitudinal analyses only, 7 participants completed extra sessions (12 in total) at the end of their eight-session set. Three extra sessions were provided by a participant in the preliminary study who sadly was unable to complete his set of eight sessions and so has been excluded from the psi data analyses, giving a total data set for the GMA analyses of 391 sessions.

Materials

The precognition computer programme (PreCOG) was developed for this field research by Jezz Fox for an Apple Macintosh MacBookPro running OS X. Custom-written software guided the participant through the procedure. A configuration file allowed specifics of the design to be set, including (a) the number of trials each participant would complete and (b) the point in the procedure at which the target was selected (randomly before the trial period for the clairvoyance protocol, after the trial period for the precognition protocol).

For each year there were 25 target sets, each containing four clips. Neither participant nor experimenter ever had prior knowledge of the potential target. In the preliminary study, the first series was run using the static targets developed for the Tibetan research (Roney-Dougal & Solfvin, 2011), and the second series used dynamic 1-min video clips developed by Dalton (Dalton, Steinkamp, & Sherwood, 1996). Dynamic video-clip targets developed for ganzfeld research by Northampton University (Roe & Holt, 2006) were used in the follow-up study. Target selection by the computer was a two-stage process: firstly a selection of the set was made, such that the participant never received the same set more than once, then a random selection of the target from within the set. All the randomizations were performed using pseudo-random algorithms.

For the choosing/rating stage of the procedure, PreCOG displayed the four items initially simultaneously at half size, and then the participant looked at them one at a time on the screen at their full size, in the order A, B, C, and D. When all four had been viewed they were again displayed simultaneously on the screen for rating on a scale of 1 to 100, with the restriction of each item having to be awarded a unique rating. Following the ratings, the data were recorded to disk before providing feedback to the participant by displaying the target for the session. The participant's mentation was recorded throughout the session.

The MAQ (Roney-Dougal & Solfvin, 2011) assessed the number of years the participants had practiced different disciplines, such as breathing techniques (pranayama) and different types of meditation practice, and the number and duration of meditation retreats the person had completed. Each participant estimated the number of hours per day or week that they had practiced the various techniques.

The TLEQ, also known as the Iowa Interview for Partial Seizure-like Symptoms (IIPSS; Neppe, 1984; Roberts, 1999), contains 40 items encompassing sensory, cognitive, and affective symptoms, as well as nocturnal phenomena that Cook and Persinger (2001) suggest may be linked with sensitivity to magnetic disturbances. Of the 40 items, 39 are rated on a 7-point Likert scale (0–6), ranging from "never" (0) to "more than once a day" (6). One item is a simple yes-no question.

The FMI (Walach et al., 2006) comprises 14 items scored on 4-point scales from "rarely" to "almost always." The questions are related to the generally accepted effects of mindfulness training.

The Necker cube test (Sauer et al., 2012) uses the bi-stable Necker cube image to assess ability to maintain focus of attention, which is associated with meditation attainment. The participant presses a key every time the image shifts from one to the other viewpoint. The measure used is the degree to which the person is able to hold to one or the other aspect of the bi-stable image.

Procedure

The procedure for each session was the same. It was recorded and presented in English on the computer and this guided the participant through the session. The same time of day and location were used, wherever possible, for each session with a given participant, and if possible, the participant always sat facing the same direction, which was recorded with a compass. Participants did only one session per day.

There was a 5-min relaxation period, a statement of intent to become aware of the target picture, followed by a 15-min meditation practice. At the end of this there was a 4-min awareness period during which participants were instructed to allow their mind to go blank and allow any target-related experience to occur. On completion of the awareness period, participants drew any mentation they had experienced that they thought might be related to the target on a pad of paper. The experimenter then joined them and they verbally described their experiences. This was recorded on the computer. The participants then saw all four video clips starting with video A and rated them on a 1–100 point rating scale according to their degree of confidence that the video was the target. Finally, the computer showed the actual target video.

After completing five sessions, each new participant completed the TLEQ; the next session they completed the FMI, and after the seventh session the Necker cube test. After eight sessions they completed the MAQ and were interviewed to obtain qualitative data concerning their previous experience of, and belief in, psychic abilities, as well as their experience of participating in the research. Participants completed the MAQ after each series of eight sessions.

Geomagnetic Data

Local geomagnetic field measurements, recorded each second, were collected from the British Geological Survey's observatory at Eskdalemuir and converted into the appropriate frequency bands by fast Fourier transform (FFT). For each session GMA was calculated for the 2-hr period ending 20 min after the start of the session-awareness period. These measurements were analyzed only after all psi data had been collected and analyzed for psi effects, so as to maintain complete masking as to this variable.

Analysis of Psi Scoring and GMA

The target-rating analysis developed for the previous meditation studies (Roney-Dougal & Solfvin, 2011; Roney-Dougal et al., 2008) was again used here to assess the level of psi awareness shown by the participants. The basic unit of analysis for the psi scoring was the participant's rating of the target for the session. This was normalized by a *z* score, TrDev, which was standardized relative to the mean and standard deviation of all ratings assigned in the session:

TrDev = (target rating - *M* of session ratings) / *SD* of session ratings

Target rating: the rating (1–100) assigned in the session to the actual target
Mean of session ratings: average of all four ratings assigned to session pool
SD of session ratings: standard deviation of all four ratings assigned to session pool
The TrDev score ranged from -1.5 to +1.5, with MCE = 0

This variable is essentially a standard normalization procedure, akin to a *z* score, which can then be used for significance and effect size analyses. This method of analyzing free-response ratings was developed and used by Stanford and Sargent (1983). There are problems with all the methods for analyzing free-response data. It was decided to use this method because it is the most sensitive to the participant's clarity of choice of the target.

Results

Overall Psi Scoring

Before analyzing the hypotheses, overall psi scoring was assessed for each eight-session series for each participant, and preliminary analyses were conducted to establish that the data could be pooled for the GMA analyses. Overall psi scoring is summarized in Table 1, and mean scoring for each participant overall in both studies is illustrated in Figure 1.

Table 1
Mean Psi Scores in the Preliminary and Follow-Up Studies, and Both Studies Combined

	N	MeanTrDev	*t*	*df*	*p* (two-tailed)	ES*(r)*
Preliminary	152	-0.07	-1.13	151	.26	-.09
Follow-up	224	-0.03	-0.62	223	.53	-.04
Overall	376	-0.05	-1.20	375	.23	-.06

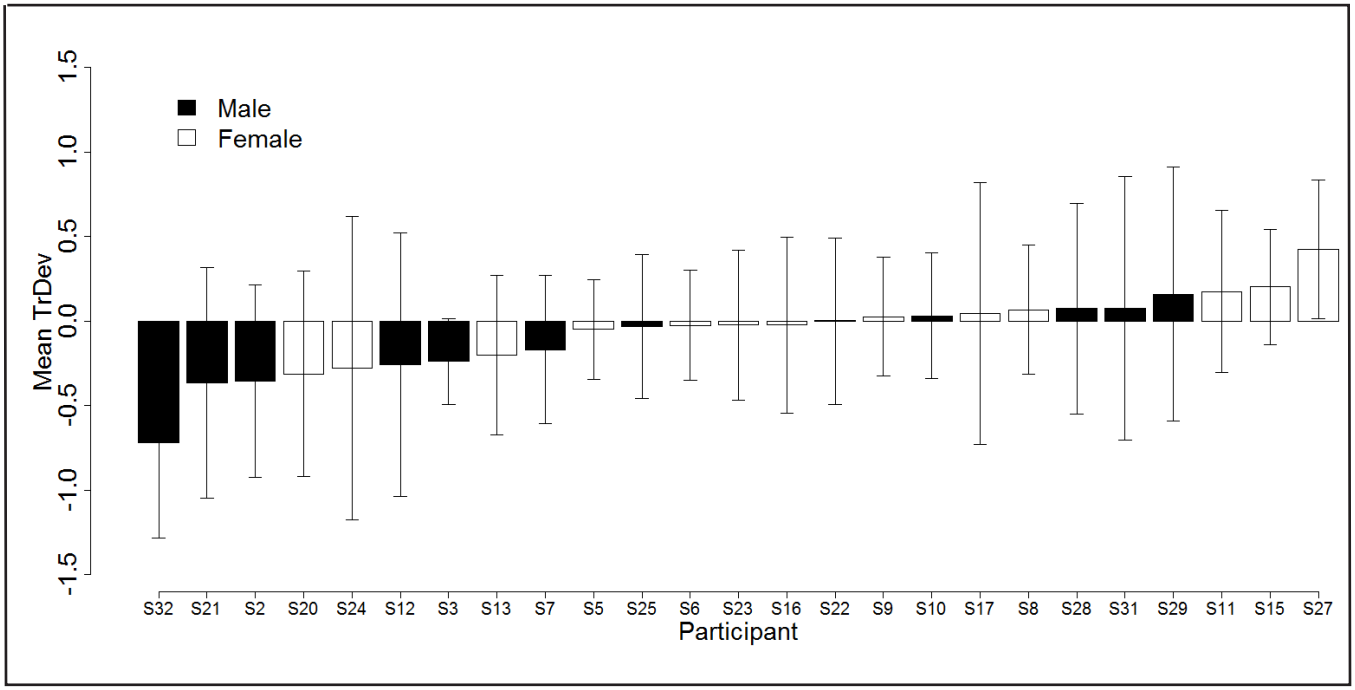

Figure 1. Mean psi score for each participant for both studies, with 95% confidence intervals.

This psi scoring is disappointing: research with long-term meditators was planned because significant psi scoring was anticipated as a result of previous findings. The absence of an overall psi effect requires an explanation, which only further research can determine. The individual psi scores are presented in the Appendix.

Gender

Table 2 shows psi scoring by gender overall for both studies. When the preliminary and follow-up studies were combined, the males were found to score significantly below chance (p = .02). An ANOVA with gender and participant as factors indicates a significant difference: for gender, $F(1, 350) = 5.72$, p = .03. Therefore, in the GMA analyses it is necessary to do further analyses by gender.

Table 2
Psi Scoring by Gender for Both Studies Combined

	n	MeanTrDev	*t*	*df*	*p* (two-tailed)	ES*(r)*
Males	136	-0.16	-2.37	135	.02	-.20
Females	240	0.01	0.18	239	.86	.01

Clairvoyance vs. Precognition

Table 3 shows psi scoring by session type (clairvoyance or precognition) for both studies combined. The table shows that the scoring in clairvoyance and precognition sessions was close to chance levels with no significant difference between the two, $t(374) = 0.23$, p = .82. Neither was there a significant interaction between gender and session type for both studies combined, $F(1, 372) = 0.17$, p = .68.

This was predicted on the basis of two previous studies (Roney-Dougal & Solfvin, 2006; Roney-Dougal et al., 2008). Thus, three studies using PreCOG have found no difference between clairvoyance and precognition sessions. Therefore, in this respect the psi data can be considered homogenous for the GMA analyses.

Table 3
Clairvoyance vs. Precognition for Both Studies Combined

	n	MeanTrDev	*t*	*df*	*p*(two-tailed)	ES*(r)*
Clairvoyance	184	-0.04	-0.65	183	.52	-.05
Precognition	192	-0.06	-1.06	191	.29	-.08

Longitudinal Analysis: Variation of Psi Scoring Over Time

There was little trend of psi scoring across the period of experimentation (preliminary study and follow-up study combined); the correlation of date with psi scoring was $r(389) = .02$, and a correlogram confirmed that the psi scoring data was sufficiently stationary to proceed with GMA analyses without further adjustment. The traditional decline effect found in parapsychology was not present in these data.

GMA During the Period of Experimentation

Figure 2 illustrates the planetary GMA (*Ap*) from 1970 to 2012. The period of the preliminary study (December 6, 2008 until May 27, 2010) and follow-up study (September 14, 2010 until October 4, 2012) are marked. Contrary to solar activity forecasts, the recent minimum of solar activity extended over several years, resulting in

extreme lows of GMA not experienced since the end of the 19th century (Echer, Tsurutani, & Gonzalez, 2011). Thus, the timing of the study was, in retrospect, very unfortunate.

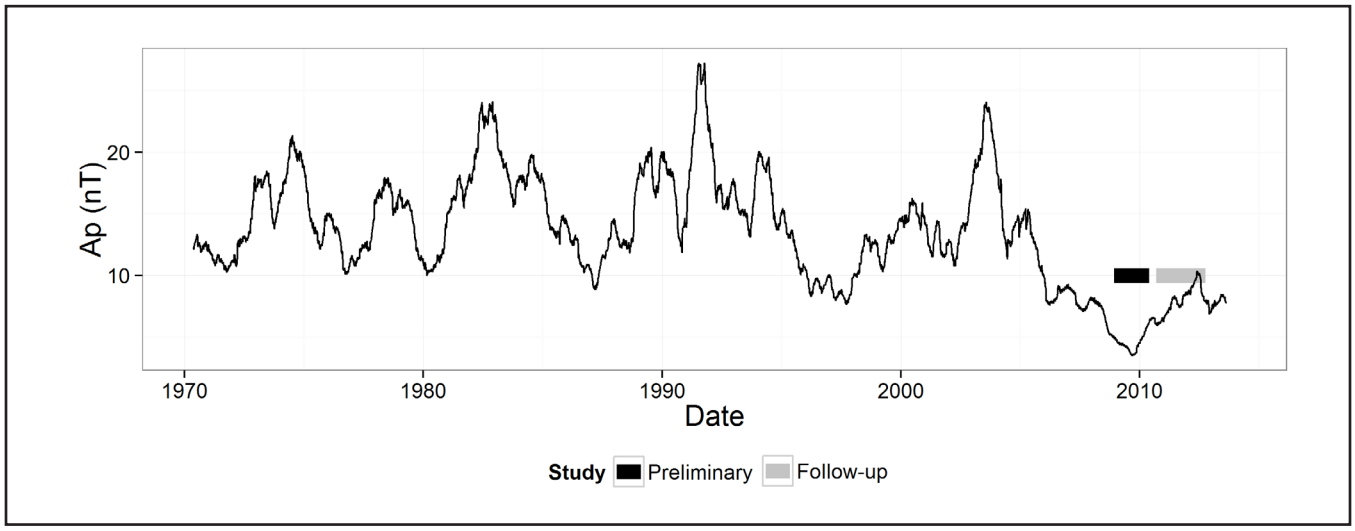

Figure 2. Smoothed index of planetary GMA (*Ap*) from 1970 to 2013. The period of the preliminary study is marked in black, and the follow-up study in grey.

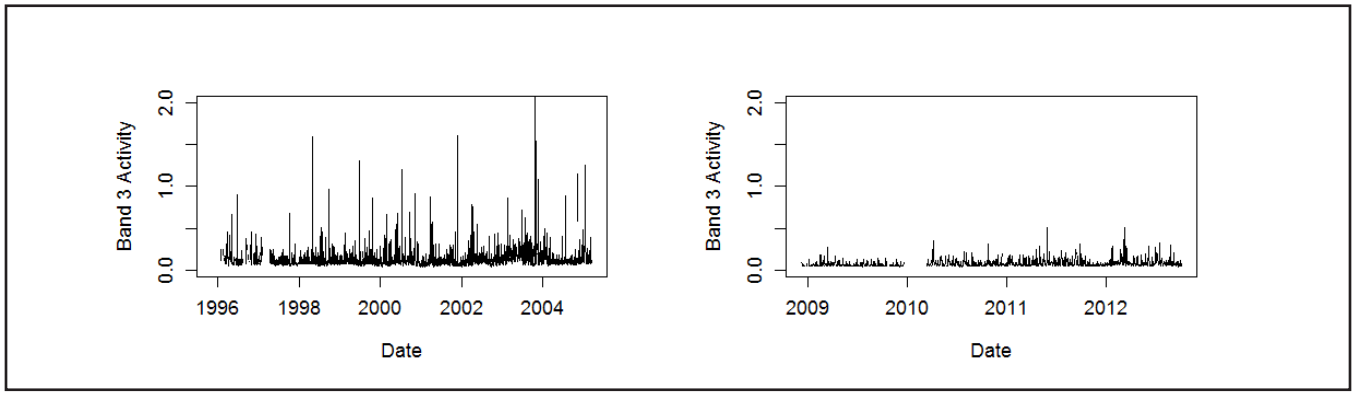

Figure 3. Left: Band 3 GMA during the period studied by Ryan (2008). Right: Band 3 GMA during the period of preliminary and follow-up studies.

Figure 3 shows the dramatic change in GMA, from the 9-year period which informed the hypotheses (Ryan, 2008) to the 4 years of this study. Therefore, the findings are for a unique window in time and so could possibly be useful as baseline data for future research using local GMA.

Band 3 GMA: Formal Hypothesis

For the GMA-psi analyses, data from all 391 sessions were used. For the geomagnetic analysis, the differences between individuals are not relevant, only the differences in success between days, because it is important to know why some days seem to be good for psi experimentation and others not. Therefore, the between-participant variance (inter-participant differences) has been removed, not the (much larger) session by session differences, by adding to each psi score (TrDev), a constant, for each participant, such that the mean for each participant is equal to the mean for all sessions. Thus, each participant's psi scores have been shifted up or down, but the variance has not been altered. The advantage of using TrDevAdj is that if we get a significant result, we know that this cannot simply be due to talented participants conducting their sessions during periods of particularly high or low GMA, because the differences in each individual's overall scoring have been removed.

There was no significant difference between psi scoring during periods of low and high band 3 activity, as shown in Table 4. Table 5 shows a breakdown of the overall results by gender. It is noteworthy how few sessions are in high band 3, only one session in the preliminary study and only 11 in the follow-up. This lack of data severely weakened the power of the band 3 analyses. The males showed the hypothesised drop in psi scoring in high band 3, whereas the females showed an opposite trend, neither to a significant degree.

Table 4
Adjusted Psi Scoring in Relation to Band 3 GMA for Preliminary, Follow-up. and Overall

	High band 3		Low band 3		*t*	*df*	*p* (one-tailed)
	N	TrDevAdj	*N*	TrDevAdj			
Preliminary	1	0.40	159	-0.06	0.57	158	.71
Follow-up	11	-0.06	220	-0.03	-0.12	229	.45
Overall	12	-0.02	379	-0.04	0.09	389	.54

Table 5
Adjusted Psi Scoring in Relation to Band 3 GMA by Gender for Both Studies Combined

	High band 3		Low band 3		*t*	*df*	*p* (one-tailed)
	n	TrDevAdj	*n*	TrDevAdj			
Male	4	-0.35	135	-0.03	-0.82	137	.21
Female	8	0.14	244	-0.05	0.63	250	.74

Band 3 GMA: Post Hoc Analyses

An alternative way of assessing the relationship between psi scoring and band 3 activity is to test for a correlation between these two variables. Spearman's rank order correlations between power in band 3 and mean psi scores are shown in Table 6. Overall there was a slight negative correlation between psi scoring and band 3 activity. For comparison, the table also shows the correlations for neighbouring frequency bands 2 (0.1–0.2 Hz) and 4 (7–22 mHz), and the 3-hr *global* index of GMA (*ap*). Note that in the follow-up study, the correlation of the global GMA index with psi scoring was significant, $r_s(229) = -.13$, $p = .04$, two-tailed.. However, one should not attach much importance to this result considering that there have been multiple analyses, the global correlation of -.13 is close to the local band 3 correlation of .10, and in the preliminary study the global correlation was in the opposite direction. The global correlation of -.13 could have been essentially due to the local band 3 correlation, but just a little stronger due to random fluctuation. This does, however, align with earlier research correlating global indices of GMA with psi scoring, in which receptive psi tends to be stronger with low intensity levels of GMA.

Table 6
Correlations Between Psi Scores and Band 3, Band 2, Band 4, and Global GMA (ap)

	N	r_s (Band 3, TrDevAdj)	*p* (two-tailed)	r_s (Band 2, TrDevAdj)	r_s (Band 4, TrDevAdj)	r_s (*ap*, TrDevAdj)
Preliminary	160	-.04	.60	-.03	.12	.12
Follow-up	231	-.10	.13	-.07	-.07	-.13
Overall	391	-.07	.15	-.05	.02	-.03

A smoothed plot of the adjusted psi scores vs. band 3 GMA for all sessions in both studies (Figure 4, top panel) suggests that psi scores were reduced when band 3 GMA values exceeded a threshold, marked by the solid vertical line. The 140 sessions to the right of this line gave a mean psi score of -0.16, compared to 0.02 for the remaining 251 sessions, which is a significant difference, $t(389) = 2.16$, $p = .03$, two-tailed. However, this threshold at which scoring dropped is at a lower band 3 activity level than that observed by Ryan (2008); this threshold (which informed our formal hypothesis) is marked with a solid vertical line in the bottom panel of Figure 4. This 2008 threshold is at the highest GMA level for this study, which emphasises how low the GMA was and the impossibility of testing the planned hypotheses. Interestingly, in a parallel project at Lancaster University, Ryan and Subbotsky (2010) studied local GMA and psi in 100 remote viewing trials and found a significant negative correlation of band 3 with psi effect size. The drop in effect size occurred at a similar threshold to this study; this is marked with a solid vertical line in the middle panel of Figure 4. Both this study and the Lancaster study were conducted during a period of lower GMA than Ryan (2008; see Figure 3), which perhaps could account for this difference. Perhaps a participant's physiological response to GMA is dependent on relative rather than absolute levels of GMA—earlier studies have indicated that psi scores are related to a drop or rise in intensity rather than the absolute level.

The 38 sessions conducted during periods of very low GMA (to the left of the dashed vertical line in the top panel of Figure 4) had a mean psi score of 0.28, significantly higher than the remaining 353 sessions, whose mean psi score was -0.08, $t(389) = 2.59$, $p = .01$, two-tailed. A similar pattern was found in the Lancaster RV study (Ryan & Subbotsky, 2010): here trials to left of the dashed vertical line in the middle panel of Figure 3 scored significantly higher than the remaining trials, $t(98) = 2.51$, $p = .01$, two-tailed. However, this pattern is not visible for Ryan (2008; lower panel of Figure 4).

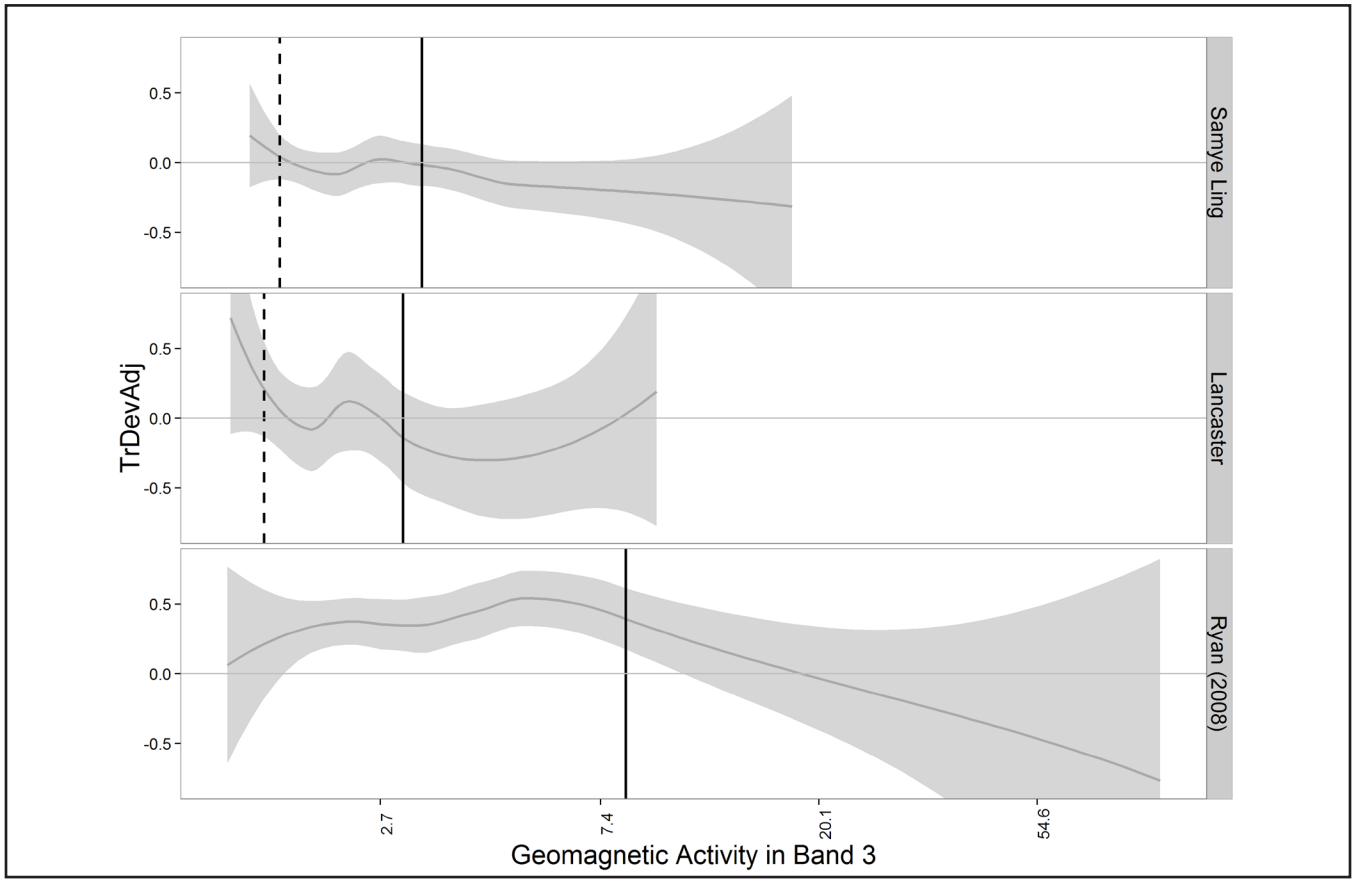

Figure 4. Smoothed mean psi score (TrDevAdj) by band 3 activity (grey line) and 95% confidence interval (grey ribbon). Top panel: Samye Ling (both studies combined); middle panel: 100 remote viewing trials conducted at Lancaster University; bottom panel: 343 free-response trials examined by Ryan (2008), on which the formal hypothesis was based. Solid vertical lines indicate GMA threshold above which psi scoring falls; dashed vertical lines indicate GMA threshold below which psi scoring increases. In Ryan (2008) only one threshold point was used.

The finding that receptive psi scoring increased with very low levels of GMA is consistent with many articles in the literature. However, because these findings are post hoc, collected under most unusual conditions with very few data points for high GMA, they should be treated with extreme caution. The strongest individual participant correlations between band 3 GMA and psi are shown in Figure 8.

Band 1 GMA: Formal Hypothesis

It was hypothesised that band 1 GMA would be positively correlated with psi scoring. However, as shown in Tables 7 and 8, there was a small and nonsignificant *negative* correlation between band 1 activity and psi scoring. This is possibly entirely attributable to the extremely low levels of GMA. The males show positive scoring in line with the hypothesis, which, considering their overall significant negative psi scoring, does give some support for the band 1 hypothesis.

Table 7
Correlations Between Psi Scores and Band 1 GMA for All Studies

	N	r_s (Band 1, TrDevAdj)	*p* (one-tailed)
Preliminary	160	-.06	.77
Follow-up	231	-.04	.72
Overall	391	-.05	.83

Table 8
Correlations Between Psi Scores and Band 1 GMA by Gender for Both Studies Combined

	n	r_s (Band 1, TrDevAdj)	*p* (one-tailed)
Male	139	.01	.45
Female	252	-.07	.88

TLEQ

As hypothesised, participants' scores on the TLEQ were negatively correlated with the correlation between band 3 GMA and psi scoring, $r(20) = -.34$, $p = .06$, one-tailed (see Figure 5). This result is marginally significant, and is due primarily to the females, $r(11) = -.45$, $p = .06$, one-tailed, the males showing no correlation, $r(7) = .24$, $p = .73$, one-tailed. In other words, response in psi scoring to Band 3 activity was more pronounced for participants who scored highly on the TLEQ. One participant (S22) scored very highly on the TLEQ, her individual correlation being significant, $r(14) = -.46$, $p = .05$, two-tailed, and this outlier data point makes a large contribution to the correlation. With the outlier removed, the overall (males and females combined) correlation becomes nonsignificant, $r(19) = -.19$, $p = .21$, one-tailed.

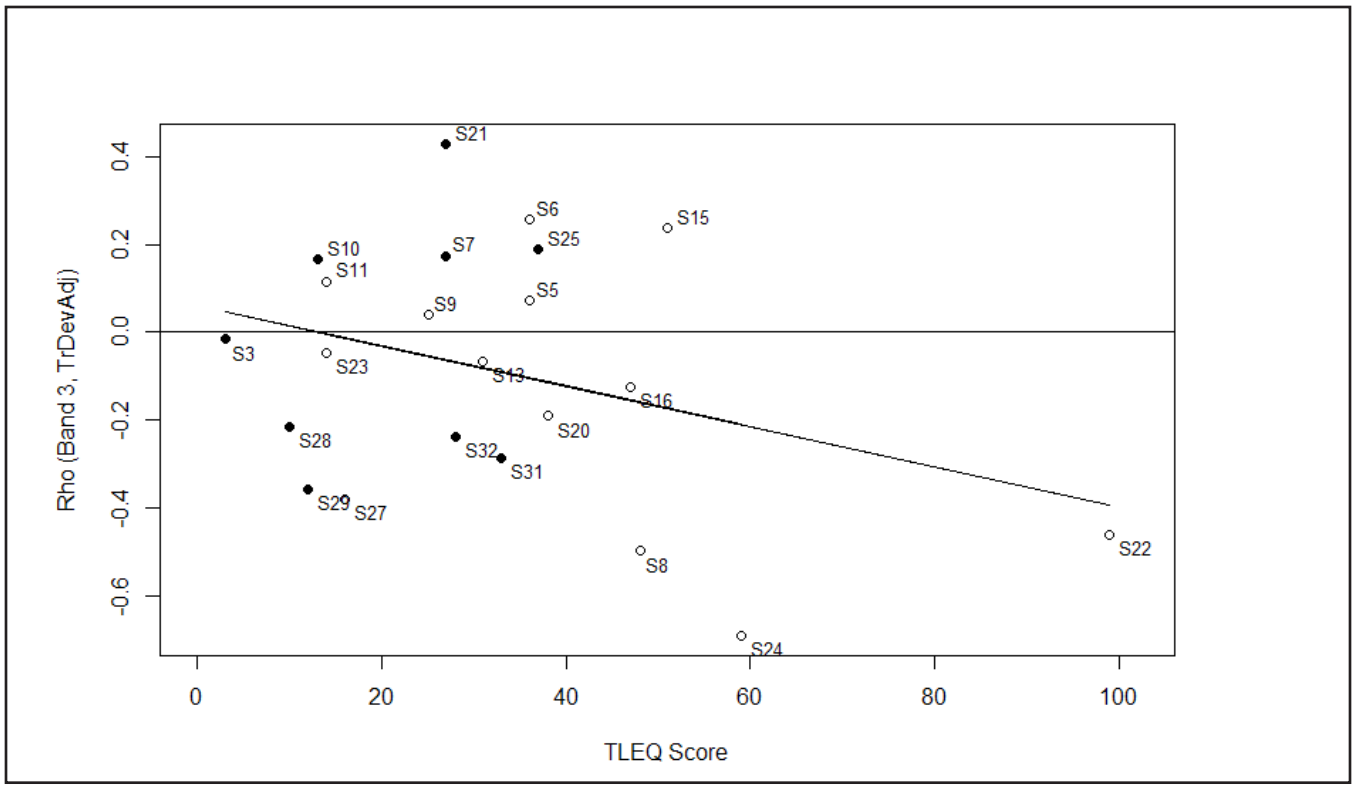

Figure 5. Participants' TLEQ scores (x-axis) vs. correlation between band 3 GMA and psi scoring (y-axis).

The correlation between participants' total scores on the TLEQ and the correlation between band 1 GMA and psi scoring was also nonsignificant, $r(20) = -.13$, $p = .72$, one-tailed. This is entirely to be expected considering the extremely low GMA and hence the absence of a correlation between band 1 activity and psi scoring.

Longitudinal Analyses

Seasonality. As shown in Table 9, the significant correlation between daily maximum temperature and psi scoring found in the preliminary study was not found in the follow-up study, or both studies combined.

Table 9
Correlation Between Temperature and Psi Scores for All Studies

	r (MaxTemp, TrDevAdj)	*N*	*p* (one-tailed)
Preliminary	.14	160	.04
Follow-up	.02	231	.41
Overall	.07	391	.09

Figure 6 shows psi scores by month for the whole 4 years of the study. Highest scores were achieved in May, but an ANOVA did not indicate a significant effect for month: $F(11, 380) = 1.07$, $p = .39$. The high scoring in May was entirely attributable to the preliminary study; scoring in May in the follow-up study was negative. Scoring from May until September was nonsignificant in the psi-hitting direction, whereas from October until April it was primarily in the psi-missing direction, most particularly in October and January. Thus, although not significant, there was a seasonal component as hypothesised, directionally supporting the Sturrock and Spottiswoode (2007) finding.

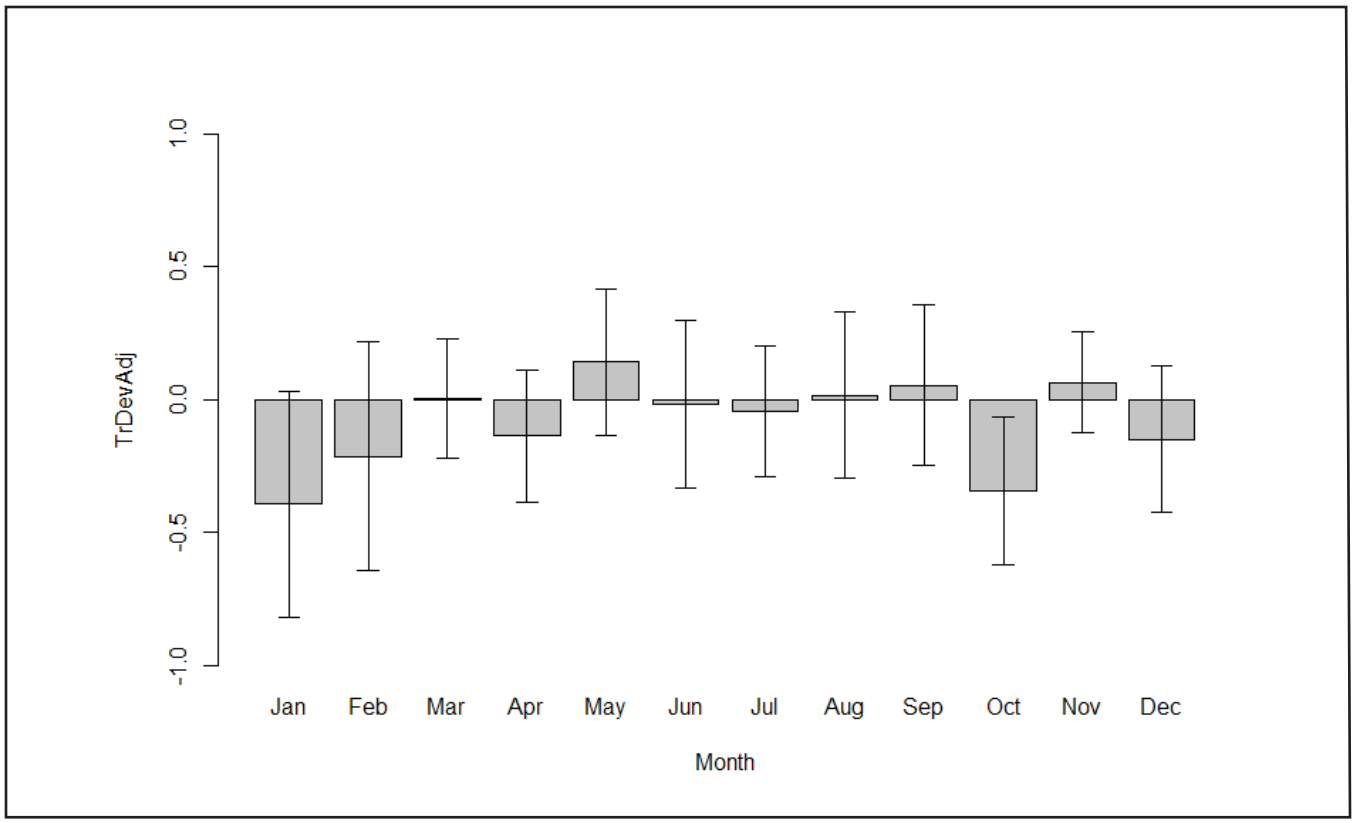

Figure 6. Adjusted Psi score by month, with 95% confidence interval (overall).

Lunar Phase. Figure 7 shows psi score by lunar phase for the overall study. No patterning by lunar phase is apparent, except for a slight tendency for scoring to rise after dark and full moons and to drop before them.

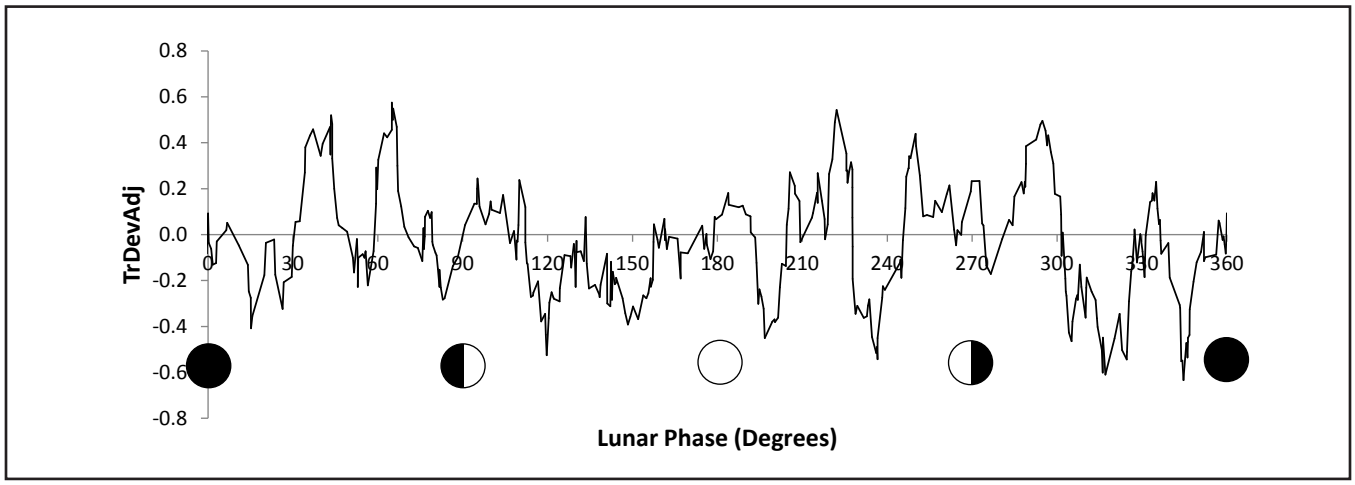

Figure 7. 12-point moving average of psi score by lunar phase (overall).

Discussion

This study was supposed to be a longitudinal study starting with GMA at the solar cycle minimum and continuing until the sunspot cycle was approaching its maximum. Instead, the sunspot activity was at its lowest in 100 years! Even at the time of completion of data collection the GMA had only just returned to the normal minimum

level. So the GMA data are completely unrepresentative of what would be expected during a normal solar cycle, and everything that follows should be taken with this consideration.

Although the formal hypotheses were not significantly supported, suggestive evidence was found that psi scoring was correlated with band 3 geomagnetic pulsations. This relationship comprises two parts: a drop in psi scoring at high levels of band 3 activity, and, in a second independent analysis, an increase in psi scoring at very low levels of band 3 activity. However, these findings should be treated with caution for the reason that the significant scoring was only found post hoc by changing the threshold levels for high and low band 3 from the hypothesised levels. To mitigate this concern, the threshold levels for the cut-off points for high and low levels of band 3 GMA were similar to those found in a parallel study at Lancaster University during the period of this study and so could be related to the unusually low levels of GMA. Also, the overall correlation between psi scoring and band 3 GMA strengthened slightly from $r = .04$ in the preliminary study to $r = -.10$ in the follow-up study, in line with the slight increase in GMA across this period. This suggests that with normal levels of GMA there could have been the expected significant correlations. If the hypothesis put forward by Ryan (2008) is correct, and the higher frequency band 1 geomagnetic fluctuations enhance psi, then it's possible that the psi scoring in the psi-missing direction found in the preliminary study is related to the almost total lack of band 1 GMA. The psi scoring did improve slightly in the follow-up study as the GMA started to increase. In the dataset studied by Ryan (2008), for the 47 trials with low GMA (across all frequencies) psi was at chance level.

The variation in psi scoring with high or low band 3 GMA was positively correlated with TLEQ scores to a marginally significant degree. Neppe (1984), Persinger (1989), and Cook and Persinger (2001) have all suggested a relationship between psi type experiences and temporal lobe symptoms. Roll (1977) in his investigation of poltergeist cases found that many of the focal people suffered from epilepsy. The significant correlation in the present study was due mainly to one participant (S22) who had very high levels of scoring on the TLEQ (see Figure 5) and who had the third highest psi score overall. Her scoring was very variable with eight direct hits out of 19 sessions, where five would be expected by chance, and six rank-four misses. This variation in scoring may have been associated with GMA: as mentioned in the results section she showed a significant negative correlation of band 3 GMA and psi scores, $p = .05$, two-tailed, as shown in Figure 8. Five of the seven high band 3 activity sessions were psi-misses, whilst the two very low band 3 GMA sessions were psi-hits. Several other participants also showed this correlation with varying degrees of significance, as shown in Figure 8. The strongest correlations are shown here and three of these are from females (S8, S22, and S24). S8 and S24 also scored highly on the TLEQ.

With respect to the higher frequency band 1 pulsations, the hypothesis of a positive correlation between psi scoring and pulsation activity was not supported, although this could be due to the very low levels of GMA throughout the period of investigation. In general (i.e., considering all experimentation, not just this study), considering (a) the persistent negative correlation of psi effect size with band 3 activity, (b) the fact that band 3 is strongly correlated with the global index of GMA *ap*, and (c) Spottiswoode's (1997a) finding of a near zero correlation between GMA *ap* and psi effect size in a meta-analysis of 2,879 free response trials, an effect of another factor, such as band 1 activity, still seems likely. In other words, if there is, in general, a negative correlation between GMA and receptive psi, then this should be evident in a large database of trials such as Spottiswoode's. But this is not the case, suggesting that there is a second factor that has a counterbalancing effect.

An important consideration regarding GMA and psi scoring is the unduly low levels of GMA shown in Figures 2 and 3. This is unprecedented in modern times and possibly could underlie the overall chance level psi scoring. Persinger (1989) remarked on how some decades are associated with very high levels of spontaneous psi reports and suggested that this may be related to decreased levels of GMA. It would, therefore, have been expected that this data would show high levels of psi, but this was not the case. More research is required!

It is possible that the effect of GMA on psi is due to *changes* in intensity. Many of the parapsychological studies of the effect of GMA on psi indicate that a decrease from an otherwise high level is related to increased receptive psi scoring; the days before and after the reported psi experience show higher GMA than the day of the experience. In this study, GMA was so low that there was very little change in either direction.

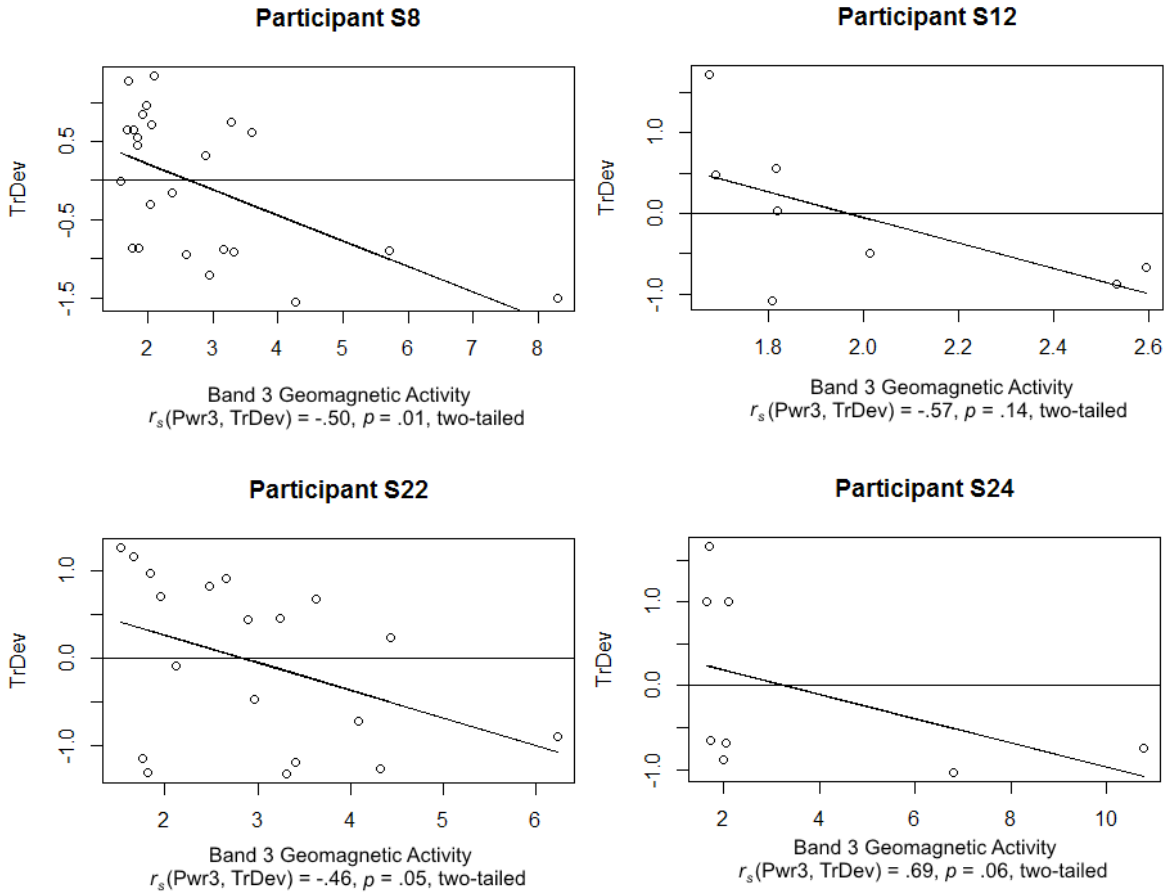

Figure 8. Individual participants' correlation between band 3 GMA and psi score.

A seasonal component was once again evident though not at a significant level. Overall, psi scoring was highest in May. This was entirely attributable to the preliminary study; scoring in May in the follow-up study was negative. Scoring from May until September was nonsignificant in the psi-hitting direction, whereas from October until April it was primarily in the psi-missing direction, most particularly in October and January. Thus whilst not significant there was a seasonal component, supporting Sturrock and Spottiswoode's (2007) finding. The weather at Samye Ling was dire throughout the summer of 2012 when most of the summer data were collected, as it was for most of Britain that year. It rained nearly every day! The weather at Samye Ling is amongst the most severe in Scotland, renowned for extreme rainfall and cold. In 2010 there were only 3 months which were frost free. In November 2009 the rainfall resulted in devastating floods in southwest Scotland. The river rose by 9 feet at Samye Ling and flooded the surrounding fields. Therefore, any sunshine and warmth that does occur at Samye Ling changes people's mood in a noticeable way! Carpenter (2012) strongly advocates taking notice of mood variables, as research suggests that these affect psi scoring. Therefore, despite the lack of significance, this is a factor that could be considered in this study. It is recommended that researchers take note of seasonal and weather conditions pertaining to their experimental sessions. This might be a possible explanation for the low psi scoring during the summer months and for the overall negative psi scoring, or this could possibly be an experimenter effect.

Overall psi scoring was significantly different between the genders: males scored significantly below chance whilst females scored at chance. This difference between the genders was also found in research with yogis in an ashram setting in India (Roney-Dougal & Solfvin, 2006). Whether this is an experimenter effect, something to do with male meditators, or some other unspecified cause is open to discussion. One possible cause is that of culture. In unanalysed qualitative data from interviews at the end of sessions, some of the male participants mentioned negative

attitudes towards psi, partly from Western cultural belief systems and partly from Buddhist teachings at Samye Ling. The correlation, found in all four Indian studies, between years of practice of meditation and increasing psi scoring did not occur in this study. Instead, throughout the 4 years of data collection, the overall scoring was at chance and in the psi-missing direction for many of the participants, though there was an incline with slightly better scoring in the follow-up study. There are several possibilities as to why this is. One of the problems in parapsychology is that like other social sciences it is a very "soft" science with multiple variables affecting every session. One of these is culture. The attitude towards psi differs between Indian yogis, Tibetan Buddhist monks, and Western meditation practitioners. The negative attitude towards psi manifested by some people at Samye Ling was initially unexpected. Apparently, the Rinpoche who founded Samye Ling discouraged people from relating meditation practice to psi effects, encouraging them to focus on the psychological and emotional benefits, such as mindfulness and compassion. Most Indians and Tibetans accept psi as part and parcel of life, whereas in the West there are strongly conflicting belief systems. In Eastern tradition, one aims for enlightenment, compassion, and wisdom. Psi is not to be aimed for but neither is it something to be shunned, and most Tibetan monasteries have a Lama who practices divination (for more details see Roney-Dougal, 2006). Conversely, many Westerners have deep and complicated fears and resistance towards exhibiting psi at a conscious level (Tart, 1984). Qualitative data for this factor is present in the interviews conducted after the completion of the sessions, and some quantitative data will be extracted from these in the future.

The psi scoring in clairvoyance and precognition sessions was almost identical. Three studies using the PreCOG methodology have found no difference between clairvoyance and precognition sessions, which suggests that receptive psi is a unitary phenomenon, the differences found between the two in previous parapsychological research being a psychological one. Whilst in this study the overall psi was non-significant, the males did score significantly albeit in a negative direction. In the Tibetan research (Roney-Dougal & Solfvin, 2011), again overall the scoring was non-significant, but one group (the Lamas) did score significantly and again there was no difference in scoring between the two types of session. In no case has there been a formal hypothesis; this is merely an interesting outcome from the PreCOG programme, and is mentioned here because it could lead to an interesting line of research. This suggestion of receptive psi as a unitary phenomenon is a reasonable one because neither participant nor experimenter knew whether the session was running in clairvoyance mode or precognition mode; that information was only accessed during the analysis. And despite the overall gender difference there was no difference for males or females in this respect.

Conclusion

These data form a unique set of measurements covering as it does a 4-year period when GMA was at an unprecendentedly low level of activity, rather than following the normal 11-year solar cycle. By the preplanned analysis, there was little difference between sessions conducted during periods with high and low band 3 activity, but post hoc, using a lower high/low threshold, a significant difference was observed. As these analyses are post hoc, they should be treated with caution. However, the GMA threshold at which scores dropped was close to that observed in a recent study of local GMA conducted at Lancaster University (Ryan & Subbotsky, 2010). Because the inverse relationship between band 3 activity and psi corroborates previous research it can be cautiously concluded that there was a band 3 effect in this data. The negative correlation found in the 2008 data which informed the hypotheses was similar to that found in this study.

There was no indication of an enhancement of psi scoring during periods of high band 1 activity. This may be attributable to the overall low levels of GMA during the study.

Overall, males scored significantly negatively, whereas females scored at chance levels; the difference was significant but this is a post hoc analysis and so is only suggestive. Researchers can learn from studies with negative results and it is important that negative results are reported. The prime consideration in this study was the effect of a moderating environmental variable on psi, so it was to be expected that sometimes there would be psi hitting, and sometimes no psi, and sometimes psi missing.

The exploratory hypothesis that participants with high scores on the TLEQ questionnaire would respond most strongly to GMA was marginally significant. However this result was due mainly to one outlier, and so needs further corroboration.

A second exploratory hypothesis concerning the effect of season on psi did show some correlation with that found by Sturrock and Spottiswoode (2007), but not to a significant degree. This could be attributable to the overall lower level of psi scoring and to the unseasonably bad weather at Samye Ling.

Despite the lack of significance, further work with local GMA measurement would seem warranted as an avenue for future research once GMA levels have returned to normal. Additionally, further work on individual differences in responses to GMA would be useful. It is recommended that researchers consider and report the phase in the solar/GMA cycle at which their study was conducted, and we would further urge researchers to record the date, time, and location of trials, and to make this data publicly available so that retrospective studies of the effect of environmental variables can be performed.

References

Campbell, W. H. (2003*). Introduction to geomagnetic fields* (2nd ed.). Cambridge, England: Cambridge University Press.

Carpenter, J. C. (2012). *First sight: ESP and parapsychology in everyday life.* Lanham, MD: Rowman & Littlefield.

Cook, C. M., & Persinger, M. A. (2001). Geophysical variables and behavior: XCII. Experimental elicitation of the experience of a sentient being by right hemispheric, weak magnetic fields: Interaction with temporal lobe sensitivity. *Perceptual and Motor Skills, 92*, 447–448.

Dalton, K., Steinkamp, F., & Sherwood, S. J. (1996). A dream GESP experiment using dynamic targets and consensus vote. *Proceedings of Presented Papers: The Parapsychological Association 39th Annual Convention*, 57–71.

Dalkvist, J., & Westerlund, J. (2000). Local sidereal time, global geomagnetic field and memory. *Proceedings of Presented Papers: The Parapsychological Association 43rd Annual Convention held in conjunction with the Society for Psychical Research*, 58–72.

Echer, E, Tsurutani, B. T., & Gonzalez, W. D. (2011). Extremely low geomagnetic activity during the recent deep solar cycle minimum. *Proceedings of the International Astronomical Union, 7 (S286)*, 200–209.

Etzold, E. (2005). Solar-periodic full moon effect in the Fourmilab RetroPsychokinesis Project experiment data: An exploratory study. *Journal of Parapsychology, 69*, 233–261.

Fraser-Smith, A. C. (1982). Is there an increase of geomagnetic activity preceding total lunar eclipses? *Journal of Geophysical Research, 87*, 895.

Hubbard, G. S., & May, E. C. (1987). Aspects of the measurement and application of geomagnetic indices and extremely low frequency electromagnetic radiation for use in parapsychology. In D. H. Weiner & R. D. Nelson (Eds.), *Research in parapsychology 1986* (pp. 79–82). Metuchen, NJ: Scarecrow Press.

Jacobs, J. A. (1970). *Geomagnetic micropulsations*. New York, NY: Springer-Verlag.

Krippner, S., & Persinger, M. (1996). Evidence for enhanced congruence between dreams and distant target material during periods of decreased geomagnetic activity. *Journal of Scientific Exploration, 10*, 487–493.

Neppe, V. M. (1984). The relevance of the temporal lobe to anomalous subjective experience. In R. A. White & R. S. Broughton (Eds.), *Research in parapsychology 1983*. Metuchen, NJ: Scarecrow Press.

Persinger, M. A. (1989). Psi phenomena and temporal lobe activity: The geomagnetic factor. In L.A. Henkel & R.E. Berger (Eds.), *Research in parapsychology 1988* (pp. 121–156). Metuchen, NJ: Scarecrow Press.

Persinger, M. A., & Krippner, S. (1989). Dream ESP experiments and geomagnetic activity. *Journal of the American Society for Psychical Research, 83*, 101–116.

Radin, D. I., & Rebman, J. M. (1994). Lunar correlates of normal, abnormal, and anomalous human behavior. *Subtle Energies and Energy Medicine, 5*, 209.

Radin, D. I., & Rebman, J. M. (1998). Seeking psi in the casino. *Journal of the Society for Psychical Research, 62*, 193–219.

Radin, D. I., McAlpine, S., & Cunningham, S. (1994). Geomagnetism and psi in the ganzfeld. *Journal of the Society for Psychical Research, 59*, 352–363.

Roberts, R. J. (1999). Epilepsy spectrum disorder in the context of mild traumatic brain injury. In N. R. Varney & R. J. Roberts (Eds.), *The evaluation and treatment of mild traumatic brain injury* (pp. 209–247). Hillsdale, NJ: Lawrence Erlbaum.

Roe, C. A., & Holt, N. (2005). A further consideration of the sender as a PK agent in ganzfeld ESP studies. *Journal of Parapsychology, 69*, 113–127.

Roll, W. G. (1977). Poltergeists. In B. B. Wolman (Ed.), *Handbook of parapsychology* (pp. 382–413). New York, NY: Van Nostrand Reinhold.

Roney-Dougal, S.M. (2006). Taboo and belief in Tibetan psychic tradition. *Journal of the Society for Psychical Research, 70*, 193–210.

Roney-Dougal, S. M., Ryan, A., & Luke, D. (2013). The relationship between local geomagnetic activity, meditation and psi.

Part 1: Literature review and theoretical model. *Journal of the Society for Psychical Research, 77*, 72–88.
Roney-Dougal, S. M., & Solfvin, J. (2006). Yogic attainment in relation to awareness of precognitive targets. *Journal of Parapsychology, 70*, 91–120.
Roney-Dougal, S. M., & Solfvin, J. (2011). Exploring the relationship betwen Tibetan meditation attainment and precognition. *Journal of Scientific Exploration, 25,* 29–46.
Roney-Dougal, S. M., Solfvin, J., & Fox, J. (2008). An exploration of degree of meditation attainment in relation to psychic awareness with Tibetan Buddhists. *Journal of Scientific Exploration, 22*, 161–178.
Ryan, A. (2008). New insights into the links between ESP and geomagnetic activity. *Journal of Scientific Exploration, 22*, 333–358.
Ryan, A., & Subbotsky, E. (2010). Negative correlation of remote viewing performance with 0.025–0.1 Hz geomagnetic pulsations. *Abstracts of Presented Papers: The Parapsychological Association 53rd Annual Convention*, 36–37.
Sauer, S., Lemke, J., Wittman, M., Kohls, N., Mochty, U., & Walach, H. (2012). How long is now for mindfulness meditators? *Personality and Individual Differences, 52,* 750–754.
Spottiswoode, S. J. P. (1997a). Geomagnetic fluctuations and free-response anomalous cognition: A new understanding. *Journal of Parapsychology, 61*, 3–12.
Spottiswoode, S. J. P. (1997b). Apparent association between effect size in free response anomalous cognition experiments and local sidereal time. *Journal of Scientific Exploration, 11*, 109–122.
Stanford, R. G., & Sargent, C. L. (1983). Z scores in free-response methodology: Comments on their utility and correction of an error. *Journal of the American Society for Psychical Research, 77*, 319–326.
Stenning, R. J., Carmody, C., & Du, J. (2002). Simulating the lunar geomagnetic variations. *Journal of Geophysical Research 107 No. A7*, SIA 12-1–SIA 12–11.
Sturrock, P. A., & Spottiswoode, S. J. P. (2007). Time-series spectrum analysis of performance in free response anomalous cognition experiments. *Journal of Scientific Exploration, 21*, 47–66.
Tart, C. T. (1984). Acknowledging and dealing with the fear of psi. *Journal of the American Society for Psychical Research, 78*, 133–143.
Walach, H., Buchheld, N., Buttenmuller, V., Kleinknecht, N., & Schmidt, S. (2006). Measuring mindfulness—the Freiburg Mindfulness Inventory (FMI). *Personality and Individual Differences, 40*, 1543–1555.

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Abstracts in Other Languages

Spanish

LA RELACIÓN ENTRE LA ACTIVIDAD GEOMAGN´ETICA LOCAL Y LA CONSCIENCIA PS´IQUICA

RESUMEN: Hay evidencia de que las experiencias psíquicas están relacionados con la actividad geomagnética (GMA). Sin embargo, a veces éstas se relacionan con mayor y a veces con menor GMA. Esta anomalía puede ser aclarada estudiando la GMA local. Para explorar esto, llevamos a cabo una investigación durante 4 años. Por desgracia, la actividad solar y la GMA estuvieron en su nivel más bajo desde hace 100 años, por lo que fue necesario combinar datos preliminares y de seguimiento en el estudio. Ambos estudios utilizaron el mismo diseño de respuestas libres. Los 26 participantes, todos ellos residían en o cerca del Centro Tibetano Samye Ling, habían practicado meditación cuando menos 10 años. Todos los participante completaron un mínimo de ocho sesiones cada año, así como tres cuestionarios y un examen psicológico. Las mediciones geomagnéticas fueron facilitadas por el observatorio del Servicio Geológico Británico ubicado cerca de Samye Ling. No hubo diferencias entre las sesiones llevadas a cabo durante la banda 1 alta o baja, o la banda 3 alta o baja pero análisis post-hoc sugieren un efecto de la banda 3 de GMA. En general, las puntuaciones psi de los hombres fueron significativamente negativas ($p = 0.02$, dos colas), mientras que las mujeres puntuaron al azar, con una diferencia significativa ($p = 0.03$). Los participantes con las puntuaciones más altas en el cuestionario de lóbulo temporal mostraron la correlación más fuerte de psi con GMA ($p = 0.06$).

French

LA RELATION ENTRE L'ACTIVITE GEOMAGNETIQUE LOCALE ET LA PERCEPTION PARANORMALE

RESUME : Il y a des preuves que les expériences paranormales sont liées à l'activité géomagnétique (GMA). Toutefois, elles sont parfois associées avec une GMA plus élevée, et parfois avec une GMA plus basse. Cette anomalie pourrait être clarifiée par l'étude de la GMA locale. Afin d'explorer cet aspect, une étude fut conduite sur 4 années. Malheureusement, l'activité solaire et le GMA furent à leur plus bas niveau depuis 100 ans durant cette période, si bien qu'il fut nécessaire de combiner les données préliminaires et postérieures à l'étude. Ces deux études ont utilisé le même protocole à réaction libre. Les 26 participants, résidant tous près du Centre tibétain Samye Ling, ont pratiqué la méditation depuis au moins 10 ans. Chaque participant a effectué un minimum de huit sessions chaque année. Trois questionnaires et un test psychologique furent complétés. Les mesures géomagnétiques furent effectuées par l'observatoire du British Geological Survey localisé aux environs de Samye Ling. Il n'y eut pas de différences entre les sessions conduites durant la GMA de bande 1 haute ou basse, ou la GMA de bande 3 haute ou basse ; mais des analyses post-hoc suggèrent un effet du GMA de bande 3. Globalement, les scores psi des mâles étaient significativement négatifs ($p = .02$, two-tailed), tandis que les femelles eurent des scores au niveau du hasard ; la différence fut significative ($p = .03$). Les participants avec les scores les plus élevés au questionnaire sur le lobe temporal montrèrent la plus forte corrélation entre score psi et GMA ($p = .06$).

German

DIE BEZIEHUNG ZWISCHEN LOKALER GEOMAGNETISCHER
AKTIVITÄT UND PARAPSYCHISCHER ERFAHRUNG

ZUSAMMENFASSUNG: Es gibt Hinweise, dass parapsychische Erfahrungen mit geomagnetischer Aktivität (GMA) zusammenhängen. Diese treten jedoch manchmal mit höheren, manchmal mit niedrigen GMA-Frequenzen auf. Diese Anomalie könnte durch die Untersuchung der lokalen GMA geklärt werden. Um dies herauszufinden, wurde eine vierjährige Untersuchung durchgeführt. Unglücklicherweise befanden sich die Sonnenaktivität und die GMA auf ihrem tiefsten Punkt seit hundert Jahren, so dass es unumgänglich wurde, die Daten der vorläufigen und

der nachfolgenden Studie zusammenzufassen. In beiden Studien wurde die Technik der freien Wahl verwendet. Die 26 Teilnehmer, von denen alle im oder in der Nähe des Samye Ling Tibetan Centre lebten, hatten eine Meditationspraxis von mindestens 10 Jahren. Jeder Teilnehmer absolvierte mindestens acht Sitzungen pro Jahr. Drei Fragebögen und ein psychologischer Test wurden ausgefüllt. Geomagnetische Messungen wurden vom British Geological Survey's observatory in der Nähe von Samye Ling zur Verfügung gestellt. Es zeigte sich kein Unterschied zwischen Sitzungen, die bei einem hohen oder niedrigen GMA-Band 1 oder einem hohen oder niedrigen GMA-Band 3 durchgeführt wurden, wobei post-hoc-Analysen auf ein GMA-Band 3 hindeuteten. Insgesamt fielen die männlichen Psi-Treffer signifikant negativ aus (p = .02, zweiseitig), während die Frauen zufällig abschnitten; der Unterschied war signifikant (p = .03). Die Teilnehmer mit den höchsten Fragebogenwerten zur Temporallappenaktivität zeigten die stärkste Korrelation zwischen Psi und GMA (p = .06).

Appendix

Table of Participants' Psi Scores

Participant	Overall			Preliminary Study			Follow-up Study			Increase
	N	Mean TrDev	*p (2-t)*	*N*	Mean TrDev	*p (2-t)*	*N*	Mean TrDev	*p (2-t)*	
S2	8	-0.35	.18	8	-0.35	.18				
S3	32	-0.24	.06	16	-0.24	.16	16	-0.23	.24	0.01
S5	24	-0.09	.51	16	-0.14	.42	8	0.02	.94	0.16
S6	32	-0.03	.88	16	-0.28	.18	16	0.23	.36	0.51
S7	16	-0.17	.42	8	0.05	.89	8	-0.39	.13	-0.43
S8	24	0.07	.72	16	0.29	.20	8	-0.38	.26	-0.66
S9	26	0.01	.94	18	-0.07	.73	8	0.20	.54	0.26
S10	16	0.03	.86	8	0.13	.63	8	-0.07	.79	-0.20
S11	17	0.21	.35	9	0.11	.73	8	0.32	.36	0.22
S12	8	-0.26	.46	8	-0.26	.46				
S13	18	-0.18	.41	10	-0.24	.39	8	-0.10	.79	0.14
S15	26	0.11	.51	8	-0.23	.53	18	0.26	.16	0.50
S16	16	-0.02	.92	8	0.29	.48	8	-0.34	.27	-0.63
S17	8	0.04	.90	8	0.04	.90				
S20	8	-0.31	.26				8	-0.31	.26	
S21	8	-0.37	.24				8	-0.37	.24	
S22	19	0.18	.42				19	0.18	.42	
S23	18	-0.03	.89				18	-0.03	.89	
S24	8	-0.28	.49				8	-0.28	.49	
S25	16	-0.03	.88				16	-0.03	.88	
S27	8	0.43	.04				8	0.43	.04	
S28	8	0.07	.79				8	0.07	.79	
S29	8	0.16	.63				8	0.16	.63	
S31	8	0.07	.83				8	0.07	.83	
S32	8	-0.72	.02				8	-0.72	.02	