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The Psychokinesis Effect: Geomagnetic Influence, Age and Sex Differences

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Abstract — Data from 621 experimental sessions carried out in Scotland, United States and Iceland were retrospectively analyzed for a possible connection between psychokinesis (PK) performance and local geomagnetic activity (K-index). Although the study did not find any significant correlation between geomagnetic activity and overall PK performance, the difference in geomagnetic activity on the day prior to the experimental sessions (split via high and low PK score) was marginally significant ($p = .08$, 2-T). The compound PK effect in the data base yielded a nonsignificant z-score deviation from MCE of 1.27, with a distribution significantly different from a normal distribution ($p = .01$, 2-T). Furthermore, males did significantly better than females ($p = .04$, 2-T), and the youngest subjects did marginally better than the oldest subjects ($p = .098$, 2-T).

Introduction

Several studies have been made to relate extrasensory perception (ESP) to geomagnetic activity (e.g. Adams, 1986; Haraldsson & Gissurarson, 1987; Persinger 1985; 1986; Schaut & Persinger, 1985). It has been suggested that the apparent relationship between geomagnetic indices and ESP could be due to the geomagnetic field factor affecting some physical ESP detection structures, rather than obscuring the alleged transmitted signal (Persinger, 1989; Roney-Dougal, 1990).

A few related indices are employed to measure the activity of the earth's geomagnetic field, each made of a combination of one or more of the three components of the magnetic force: Declination (D), Horizontal (H) and Vertical (Z). The so-called K-index is probably the most widely used index, based on the horizontal components only and is available for three-hour periods. The Kp-index is commonly used as a global K-index and is calculated for each day from measures made at 13 magnetic observatories located around the world. Another such index is the aa or antipodal index, which contains half-day measures for each hemisphere and has the advantage of having been recorded for over a century.

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In a previous collaborative paper, Haraldsson and Gissurarson (1987) reported a retrospective analysis of two kinds of ESP experiments for a possible relationship with local geomagnetic activity (K-index). They found that free-response ESP scores from 70 Ganzfeld sessions (telepathy/clairvoyance) were significantly related to high geomagnetic activity of the day prior to the experimental sessions ($rs = .23$, $p = .03$, 1-T) but not to the geomagnetic activity of the day of the sessions. The same relationship was found in 269 experimental sessions each of which consisted mostly of forced-choice 80 trials clairvoyance computer test ($rs = .10$, $p = .05$, 1-T). These results partially confirmed Persinger's (1985; 1986) hypothesis that paranormal experiences tend to occur on a day of low geomagnetic activity which is preceded by days of high geomagnetic activity. The Haraldsson and Gissurarson's data indicated however that high geomagnetic activity during one day prior to ESP performance might be the crucial influencing factor.

Although the purported relationship between geomagnetic activity and ESP has received some experimental attention, there has been much less focus, if any, on possible comparable effects for psychokinesis (PK). In the present study data from 621 experimental sessions were retrospectively analyzed for a possible connection between PK performance and local geomagnetic activity (K-index). Furthermore, effect sizes, age and sex differences for PK were examined.

If a replicable relationship between PK performance and geomagnetic activity, age and/or sex was found it could be considered as evidence for PK. Such a relationship may even yield a more convincing argument for PK than a simple deviation from chance, because it may be more difficult to dismiss as fraud or device error. The finding could also be used in order to select those groups of subjects who are more likely to yield high PK score, and to select the favorable period of time for testing for PK. Furthermore, the specific findings would be important for theory construction regarding PK processes.

Method

The Geomagnetic Field

The sum for the day of 3-hour K-indices of geomagnetic activity were used, recorded at Eskdalemuir (in the vicinity of Edinburgh), Fredericksburg Virginia (the closest geomagnetic station to Durham, North Carolina) and Leirvogur (in the vicinity of Reykjavik) magnetic observatories. The local K-index was selected rather than the global index since it should be a more exact measurement, although any local K-index closely parallels the global index, generally speaking.

The Psi Apparatus

The PK data in this study was obtained on one of two random number generator (RNG) based computer games.

Psi Invaders. The Psi Invaders computer game (Berger & Honorton, 1985) works as follows: Players attempt to shoot down invaders from space with a

laser gun, and press a button on a game paddle to fire the laser. The cover story is that the laser is old and frequently misfires, so the player is asked to use "The Force" to make it fire. Laser firing is contingent on the output of an RNG. With each button-press, the RNG is sampled one "run" (consisting of 100 binary trials, $p = .5$). Run score of 51 or greater are required for the laser to fire (hit). Run scores of 50 or less result in a misfire (miss).

Synthia. The Synthia computer game (Gissurarson, 1989) works as follows: For each trial four windows appear on the screen. An RNG (either pseudo or true) selects one of the windows as a target for every 10 trials of a 40-trial run. An arrow appears beneath the designated window showing that it is the target. The task consists of attempting to make the computer select the designated target window each time the player presses the space-bar, thereby initiating the RNG once more. Each trial is tallied as a "hit" or "miss", depending on whether or not the number actually selected matches the assigned target number.

The Studies

PK score from 11 experimental series carried out between 1985 and 1990 in Scotland (University of Edinburgh, Edinburgh), United States (Foundation for Research on the Nature of Man, Durham) and Iceland (University of Iceland, Reykjavik) were retrospectively examined for this study. The date had been recorded for all sessions. All PK score were standardized via z-transformation to make them identical.

Series 1-2. Series 1 and 2 were conducted in the U.S. and Iceland, respectively, each with 15 subjects, to test the efficacy of Psi Invaders to elicit PK. Each subject completed one session of three runs on Psi Invaders, yielding 30 sessions overall (Gissurarson, 1986).

Series 3-7. Series 3-7 were conducted in Scotland, with 10, 40, 10, 20 and 90 subjects, respectively, to examine a possible relationship between PK and some psychometric scales. Each subject completed one session of two runs on Synthia, yielding 170 sessions overall (Gissurarson & Morris, 1991).

Series 8-9. Series 8 and 9 were conducted in Scotland, with 24 and 52 subjects, respectively to test the efficacy of three imagery strategies in producing extrachance PK score. In Series 8, each subject completed six sessions of two runs on Synthia. In Series 9, each subject completed four sessions of two runs on Synthia. Overall 352 sessions were conducted (Gissurarson & Morris, 1990).

Series 10. Series 10 was conducted in Scotland with two subjects mainly to investigate the possibility of exceptional PK performance. The two subjects completed five and four sessions of two runs on Synthia, yielding 9 sessions overall (Gissurarson, 1989).

Series 11. Series 11 was conducted in Scotland with 119 subjects to examine the effect of two different instruction sets on time used on psi tasks, amongst other things (Gissurarson, 1991; Gissurarson & Morris, 1992). Half of the subjects were given PK instruction and completed one session of two runs on Synthia, yielding 60 sessions overall. The other half of subjects were given pre-

TABLE 1

Product-moment r for PK score and daily K-index sum for the day of the experimental session (day 0), 1–7 days prior to it (days –1 through –7), and 1–2 days following it (days +1 through +2).

Log base 10 of the K-index for seven days prior and two days following the PK session:	-7	-6	-5	-4	-3	-2	-1	0	+1	+2
PK score: (n=621)	.04	.03	-.01	.01	.00	.01	.05	.01	-.04	.02
Synthia (n=591)	.04	.03	.00	.01	-.01	.01	.04	.02	-.04	.00
Psi Invad. (n=30)	-.25	-.10	-.31	-.11	-.06	-.28	.01	-.41*	-.25	.18

* P<.05, two-tailed.

cognition instruction (59 sessions). These were excluded from the present analysis, which was only concerned with psi score obtained under PK instruction.

Results

Geomagnetic Effect

Persinger (1989) suggests log transformations of the geomagnetic indices to minimize the effects of outliers. Log base 10 of the K-index values (daily sums) were not significantly correlated with overall PK performance, for the day of the experimental session, 1–7 days prior to it, or 1–2 days following it (Table 1).

We can examine the difference in geomagnetic activity when high and low score (irrespective of direction) was obtained. Splitting the group arbitrarily around a two-tailed p-value of .30 gives us a reasonable sample of 169 high-scorers (scoring above $z=+1.05$ and below $z=-1.05$), against a sample of 458 low-scorers (scoring between -1.05 and +1.05). High score tended to occur on days preceded by a day of high geomagnetic activity, followed by a day also of high activity, whereas low score tended to occur on days preceded by a day of low geomagnetic activity, followed by a day also of low activity (Fig. 1). Of the 10 days examined (the day of the actual experimental session, seven days prior to it and two days following it), the difference in geomagnetic activity on the day prior to the session came closest to a significance; $F_{1,615}=3.12$ ($p=.078$, 2-T). The difference in geomagnetic activity on the seventh day prior to the session (split via high- and low-scorers) demonstrated $F_{1,619}=2.91$ ($p=.09$, 2-T), and the second day following the experimental session showed $F_{1,619}=2.31$ ($p=.13$, 2-T)[1]. Other differences were insignificant.

We can break the data down between countries and psi apparatuses, Psi Invaders representing the small U.S. and Icelandic samples and Synthia representing the large Scottish sample (Table 1). Whilst the relationship for the Scottish sample (n=591) between PK score and K-indices is virtually nil for all days, the U.S. and Icelandic samples (n=30) produce negative correlations for

[1] The somewhat inconsistent n's and df's are due to a few missing measurements of the K-index at the Fredericksburg observatory.

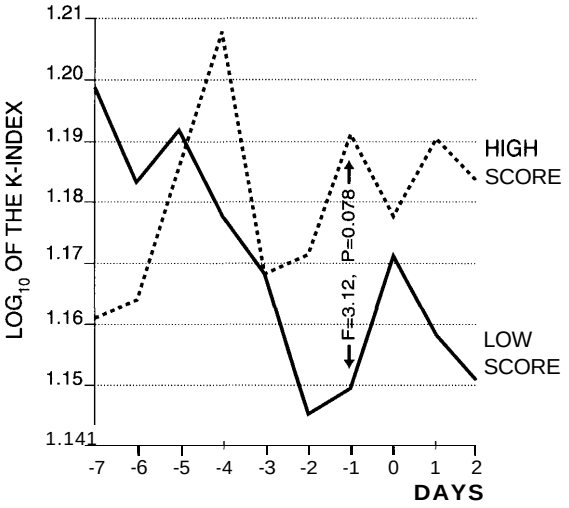

Fig. 1. Log $_{10}$ of the K-index sum for days before, during and after the experimental session.

all days with the exception of the day prior to the experimental session and two days after it. Only the correlation on the day of the actual session was significant, r(30)=-.41 (p=.03, 2-T), which is in line with Persinger's hypothesis, that psi is more likely to occur during periods of low geomagnetic activity. Once combined with the Scottish data, however, this significant effect disappears entirely.

PK Effect, Age and Sex Differences

The compound PK score (mean=.041, SD=.995) of the 11 experimental series (621 sessions) yielded a nonsignificant, unweighted, composite z-score of 1.27 (p=.10, l-T) (Rosenthal, 1984). Thus the overall PK score did not demonstrate a significant deviation from mean chance expectation (MCE) in the present study. The distribution of the PK score was however markedly different from a normal distribution according to a Kolmogorov-Smirnov test; K-S z=1.57 (p=.01, 2-T).

Males completed 261 sessions (42%) and obtained mean PK score of .15. Females completed 360 sessions (58%) and obtained mean PK score of -.04. The difference in performance of males and females was significant $F_{1,619}$=5.25 (p=.02, 2-T).

Since it is not known whether a curve between PK performance and age, if such exists, follows a linear rule, trend analysis was conducted for linear and curvilinear regression (Hays, 1988). On evaluating these F tests (Table 2 and Fig. 2), we find that unweighted linear regression is significant beyond the .05 level (2-T), and that the unweighted cubic regression yields a p-value of .10 (2-T). Quadratic, quartic and quintic trends were not significant and yielded p-values of .27, .52, and .42, respectively. Actually, curvilinear regression counted for

TABLE 2
Summary table of F tests for linear and curvilinear regression between age and PK score.

Source	SS	df	MS	F	P*
Between groups	6.19	6	1.03	0.99	-
Linear regression					
Unweighted	4.55	1	4.55	4.35	0.04
Weighted	1.51	1	1.51	1.44	-
Other trends	4.68	5	0.94	0.89	-
Cubic regression					
Unweighted	2.79	1	2.79	2.67	0.10
Weighted	3.06	1	3.06	2.92	0.09
Other trends	1.60	3	0.53	0.51	-
Within groups	248.25	237	1.05		
Totals	254.44	243			

* Two-tailed.

slightly more variance (sum of squares = 4.68) than did linear regression (sum of squares = 4.55). However, if we dismiss the group over 70 as a special category due to too few cases, and combine it with the group of subjects aged 60–69 years, the F-ratio for the unweighted linear term for the group over 60 becomes 2.56 (p = .ll, 2-T), and the cubic term vanishes. The difference between the group of subjects 19 years old and younger (n = 20) and the group of subjects 60 years and older (n = 14) demonstrates a F-ratio of 2.91 (p = .098, 2-T).

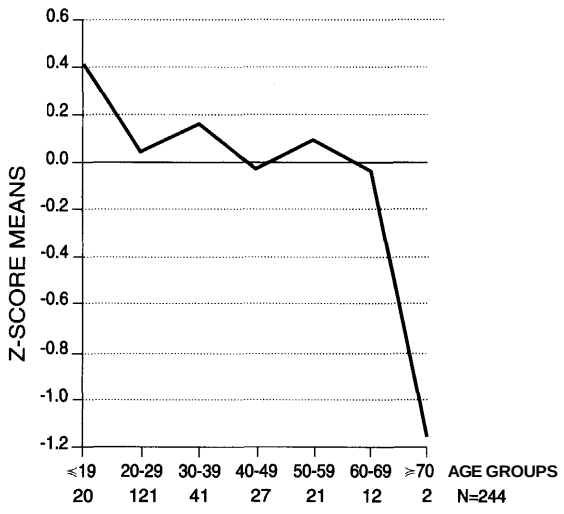

Fig. 2. Plot showing linear by cubic interaction between age and PK score.

Discussion

The present study did not find a significant correlation between geomagnetic activity and overall PK performance. However, the difference in geomagnetic activity on the day prior to the session (split via high and low PK score) was marginally significant ($p = .078$, 2-T). High scores were preceded by high geomagnetic activity and low score were preceded by low geomagnetic activity. This is the same form of a relationship as Persinger (1989) has reported for experimental ESP data, although again in line with Haraldsson and Gissurarson (1987) insofar as they found geomagnetic activity one day prior to an ESP session to be the crucial influencing factor. It should be noted that the difference in geomagnetic activity on the seventh day prior to the session also turned out to be marginally significant. Future research will have to determine whether these suggestive trends become more than marginally interesting with large enough n's.

In parapsychology, RNG-PK experiments have been shown to have a small effect size, hence demand many more trials than typical psychology experiments. The average PK score bias from MCE was .041 in the present study. Although this size of an overall deviation from chance turned out to be non-significant, it is in fact comparable to experimental PK effects found by others (e.g. Jahn & Dunne, 1987; Nelson et al., 1986). In summarizing six years of experimental data Jahn and Dunne found, for instance, a mean bias of .037 for trials obtained when subjects had been instructed to influence a random distribution above chance on both true RNG and pseudo-RNG generated targets. This bias was significant for the true RNG trials where 87 experimental series had been conducted ($z = 2.67$, $p = .004$), but not significant for the pseudo-RNG trials where 29 experimental series had been conducted ($z = 1.42$, $p = .08$). What seems to substantiate an idea to the effect that the present data-pool was too meager to allow real, albeit small, PK effect to turn significant is the result of the Kolmogorov-Srnirnov test. It showed that the z-score distribution of the PK score was significantly different from a normal distribution, hence suggesting that some anomalous effect may have been present in the data.

In the present study, PK performance tended to deteriorate with age but only when the two subjects over 70 were kept as a separate group. The difference between the group of the youngest subjects (19 years old and younger) and the oldest subjects (60 years and older) was marginally significant on a two-tailed test. A relationship between age and PK has not been reported in the literature to the author's knowledge and this marginal effect would seem to merit further research with large data-pools. If this effect should hold in further replications, it is particularly interesting because it could imply a physical source of the controversial, elusive phenomenon called PK.

Perhaps the most interesting finding in the study, at least the most straightforward one, turned out to be the sex difference in PK performance, males scoring above chance and significantly higher than females who were slightly below chance. Somewhat inconsistent sex differences have been found in PK performance in studies with a low number of subjects. In a study with 28 subjects,

Weiner (1979) found males scoring above chance and significantly higher than females who scored below chance. Weiner et al. (1980) reported a study with 9 and 10 children in each of two groups. They found for the first group that boys scored above chance and significantly higher than girls who scored below chance, whereas for the second group this trend was significantly reversed. In a study with 20 children, Weiner and Munson (1980) found girls scoring above chance and significantly better than boys who scored below chance.

If the sex difference found in this sample proves replicable to some degree, one implication emerges immediately. In the present study females (55%) outnumbered males (45%) in volunteering for participation, the difference came close to significance on a binomial test ($p = .06$, 1-T). This would seem to substantiate Weiner's (1982) observation that females were significantly more likely to volunteer for parapsychology laboratory testing than were males. Yet females appear to do worse on PK tasks. Thus in enhancing effect sizes for PK, one may want to control the participation of females to some degree.

Obviously one would have desired more clear-cut results with regard to the geomagnetic and the age variables. A one-tailed examination of the data would have rendered significant effects on these issues, instead of, as the case was, results on the verge of being taken seriously. Since the nature of the study must be regarded as exploratory, in the sense that PK has not been examined before in the context of age and geomagnetic activity, a one-tailed analysis would hardly have been appropriate. The vagueness of the results is however in line with the now predictable uncertainty of the phenomenon, leaving researchers in this area quite often somewhere between the devil and the deep blue sea. Therein lies the challenge, but unfortunately also the frustration. The findings, unclear as they may be, can nevertheless serve as a guideline for future predictions.

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