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"We are still learning much about the nature of experience, about the full range of biological input and output systems, about cognition and memory, and about the strategies of deception. Much can be explained in ordinary terms if we consider the circumstances carefully. We must avoid the bias of assuming that such explanations can account for everything, that there are no truly new principles of nature to be learned. Conversely, we need to proceed with caution and not assume that each unexplained phenomena is valid evidence for some major undiscovered force in the world around us."

In memory of Bob Morris

Koestler Professor of Parapsychology
(1985-2004)

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Magnetic Variances Associated with 'Haunt-type' Experiences: A Comparison Using Time-Synchronised Baseline Measurements

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Abstract

Recent laboratory studies have revealed that human exposure to low-frequency complex electromagnetic fields (EMFs) can induce strange and exceptional hallucinatory experiences under controlled conditions. A number of field-studies have also shown that reputedly haunted locations can be magnetically distinguished from non-haunted areas in the natural setting. However, none of these studies have employed appropriate time-linked baseline measurements taken from haunted and baseline areas simultaneously. This study presents the first magnetic investigation of a reputedly haunted location that employs and formally compares high-speed time-linked magnetic baseline measurements. The results show separate effects of both elevated levels in the ambient spatial magnetic field, and the nature of how magnetic fields vary over time (i.e., their complexity) in areas of interest. The implications of the current findings for the magnetically remarkable nature of reputedly haunted buildings are discussed.

Introduction

Recent evidence suggests an association between the presence of variable *geomagnetic fields* (GMFs) and/or power-frequency *electromag-*

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netic fields (EMFs) with changes in neurophysiological activity and behaviour (Bell, 1992, 1994; Cook & Persinger, 2001; Fuller, Dobson, Wieser, Moser, 1995; Gearhart & Persinger, 1986; O'Connor, 1993; Papi, Ghione, Rosa, Del Seppia & Luschi, 1995; Persinger, Ludwig, Ossenkopp, 1973; Persinger, 1988, 1993; Persinger & Koren, 2001; Randall & Randall, 1991). Similarly, a growing number of studies have suggested that such GMFs/EMFs could also underlie some reported instances of *'haunt-type'* experiences – see Persinger & Koren, 2001, Roll & Persinger, 2001 for reviews. Based on these findings researchers are proposing that perhaps some aspect of these *'Experience Inducing Fields'*[1] could be present at locations that have been associated with producing multiple instances of these experiences spontaneously (Persinger et al., 2001; Persinger & Koren, 2001; Persinger & Richards, 1994; Persinger, Richards, & Koren, 1997; Roll & Persinger, 2001). The implication from this is that many strange (i.e., haunt-type) experiences reported at such locations could actually represent a spontaneously occurring magnetically induced hallucination. Individuals who report haunt-type experiences may well have been exposed to crucial EIFs present at that location, and at that time. The general prediction here is that discrete changes in the localized magnetic field will correlate with discrete changes in the neural activity in observers and these will have very real consequences for cognition under certain circumstances.

Inspired by findings from laboratory studies many researchers are now visiting particular locations of interest in an attempt to define the presence and mechanisms for the spontaneously occurring natural homologue of these fields. The idea of an environmental component to the induction of these experiences can be a useful approach to the field-based investigation of a haunting as it does generate a number of helpful and testable notions concerning the spontaneous occurrence of apparitions in the natural setting.

Perhaps the most prominent question here is whether these microenvironments are indeed 'magnetically remarkable' in any way compared to baseline locations? If this is the case, then the question becomes, what exactly is remarkable about them? There are a number of possibilities. For instance, perhaps the ambient GMFs/EMFs are generally and permanently more elevated or excessive when compared to

[1]Research suggests that both GMFs and EMFs of diverse frequencies and amplitudes could have consequences for human experience. Therefore, these fields are given the generic term here of *'Experience Inducing Fields'* to encompass any form of magnetic field with potential stimulatory properties.

baseline locations? Alternatively, perhaps the crucial EIFs are more transient, variant and volatile, occurring sporadically from time to time? Perhaps both these factors are crucial and high variances exist in an environment that already contains magnetically dense and excessive fields? The possibilities are legion. With respect to the first scenario, one prediction would be that researchers should be able to quantify such constant and stable differences quite easily during field-studies carried out at any time. A useful metaphor here seems to be one like a cardiac arrest can leave in a heart trace recording. In this sense, significant events can take place, they can come and go, but there is always an underlying current or signature that can be identified and distinguish such traces even in the absence of the significant event itself.

In contrast, the second scenario suggests that simply taking measurements at any given instance may in fact miss the occurrence of the crucial EIFs that could exist, but may well be indistinguishable at the time of measurement. The implication here is that measurements must be taken before, during and after the event in order to truly evaluate the spontaneous occurrence of the anomaly relative to the background measurements. Irrespective of these possibilities, carrying out detailed magnetic surveys of reputedly haunted locations could potentially be very revealing. Indeed, if the laboratory studies have identified a mechanism that could operate in the natural environment, a true test would be to show that such a mechanism is, at the very least, present in some form in these natural settings.

There are a couple of points, often overlooked, but worth highlighting regarding the field application of the magnetic stimulation account. Firstly, it is important to remember that such stimulation has been shown to be particularly likely in labile and neuronally hypersensitive brains (Persinger, 1999a, 1999b, 1995, 1987; Persinger & Richards, 1994; Persinger, et al., 1997; Persinger & Koren, 2001; Persinger & Maharec, 1993). This interaction between susceptible brains and environment may suggest that excessive fields themselves are not necessary, and may also explain why many people report anomalous experiences in certain environments while others do not. Indeed, the emerging picture seems to suggest that it is the complexity of the magnetic fields and not necessarily the overall amplitude or strength that is crucial for brain stimulation to occur (Persinger, 1999a, 1999b, 1995, 1987; Persinger & Richards, 1994; Persinger & Koren, 2001; Roll & Persinger, 2001). Such complexity could come in a number of forms including the existence of multiple frequency components, highly variable amplitudes, phase differences, or a combination of all these factors. Secondly, reports of strange experiences do not happen instantaneously, but rather after a more prolonged period of exposure (approx 20–30mins in the laboratory). This suggests that the mechanism of interaction is a subtle one perhaps at the level of psychopharmacological effects between synapses of neurons or increased hyper-polarisation of specific inhibitory neuronal systems. The consequence of which would be disinhibition, the neuronal basis for hallucination and altered states.

Irrespective of how such stimulation could occur, demonstrating that a magnetic anomaly exists at certain locations is one side of an important theoretical equation that may also require certain types of individuals in order to respond to these EIFs. Although the laboratory studies are convincing, natural field studies of haunted locations present a somewhat more mixed picture.

Magnetic studies of 'haunted' locations

Magnetic surveys of reputedly haunted locations have suggested that both increased levels of the localized ambient GMFs (Nichols & Roll, 1999; Roll & Nichols, 1999; for reviews see Persinger & Koren, 2001; Roll & Persinger, 2001) and increased levels in EMFs (Nichols & Roll, 1998; Persinger et al., 2001; Roll, Maher & Brown, 1992) can be associated with anomalous effects and strange experience. It has also been argued that the ambient geomagnetic field varies more over small spatial distances (e.g., in a room) than what would be expected naturally (see Persinger & Koren, 2001; Persinger et al., 2001; Roll & Nichols, 1999; Roll & Persinger, 2001; Roll, Moody & Radin, 1996). In relation to the possibilities outlined above this could mean that such studies revealed a more permanent magnetic characteristic of the locale as being important or that the researchers were present at the same time as the more variant fields (though this last point seems unlikely). Either way the implication is that ambient magnetic anomalies are associated with reputedly 'haunted' areas and are an important distinguishing factor.

Other studies have identified nothing remarkable about the ambient background fields at all, but suggest either that odd and significant pulses occurred during the measurement session or that the manner in with the field is varying is crucial (i.e., their complexity: Persinger & Cameron, 1986; Wiseman, Watt, Greening, Stevens, & O'Keeffe, 2002; Wiseman, Watt, Stevens, Greening, & O'Keeffe, 2003). This is in line with the predictions from laboratory findings. Finally, it is worth noting that some researchers have failed to find any magnetically distinguishing feature between haunted and non-haunted areas in locations of interest (Maher & Hanson, 1997; Maher, 2000). This may be due to the equipment used in those studies, or indeed that the experiences reported by witnesses do not have an underlying magnetic anomaly associated with them. It is likely that many environmental cues can contribute to the induction of haunt-type experience.

Problems with prior studies

One problem with the magnetically induced hallucination account is that terms such as *'complexity'* are often unclear and ill defined. What contributes to this complexity? Is it amplitude variance, frequency components, waveform shapes or all of these together? It is certainly the case that 'complexity' can refer to many components and indeed all these components combined. Furthermore, even if we accept the term complexity in terms of exposure to the human brain, in the natural setting this could happen in a number of ways. For instance, 'complexity', or indeed the crucial aspect of it, may well be a time varying property of the incoming magnetic signal or field itself. In this sense the source could be many things both natural and man-made but the complexity is based in the signal. It is a time-based component or property contained within the signal. Another way to conceptualise complexity could be that in small areas (i.e., a room) the actual background fields are constant, but highly variant across space with peaks and troughs distributed across the microenvironment (as noted above, see, Persinger & Koren, 2001; Persinger et al., 2001; Roll & Nichols, 1999; Roll & Persinger, 2001; Roll, Moody & Radin, 1996). In this sense the complexity is not in the signal per-se (as this is relatively constant) but an individual's movement through a spatially variable field. Again at the level of exposure and stimulation, the brain may be receiving a time-varying component to the strength of the signal but, under these circumstances, there is no time changing component to the signal itself. This could be conceived of as complexity over space (not time). This is important as what it highlights is the need to check for a number of potential sources, using a variety of methods over both space and time to disambiguate the nature of such field variances (see Roll & Persinger, 2001 for a similar discussion). Both the above scenarios could expose the brain to a time varying component in the magnetic field (which could be further boosted by our movements through these fields). We know what we are looking for (a magnetic anomaly) but we do not necessarily know what it will look like! These points may also account for some of the confusion surrounding this debate and the mixed findings across many studies. The laboratory studies have shown one way that magnetic stimulation works (by using artificial time-varying signals), but this may not be the only way.

One major problem with the field studies currently available is that few, if any, have employed the use of time-linked (i.e., synchronized) baseline measurements. A recent, but by no means unique, example is the study of Wiseman, et al. (2003) where it appears measurements were taken sequentially from either a baseline location or 'active' locations. These separate measurements are then formally compared statistically.[2] Although perfectly legitimate, this method is open to some criticism. For instance, how do researchers know that as they are measuring one area, the other areas are not also displaying the same magnetic qualities at that very point in time? They do not. To put it another way, many previous studies have attributed what may be a variance in the signal over time (across the different recording periods) to a difference in the characteristic in the signals available from those locations over space. A more conservative test would be to measure reputedly haunted and non-haunted baseline areas simultaneously. There are a number of advantages to this approach. Firstly, the researcher could ascertain to some degree how localized any magnetic anomaly could be. If a particular magnetic event was measured on one sensor but not the other sensor then it may be that such an event was localized (for whatever reason). However, if all sensors in different areas measure the event it may represent a more general change. Secondly, it is a more direct test of whether the overall ambient field levels or the nature of the variance itself really is distinguishable across areas at any given point in time.

One argument against these suggestions might be that it is unlikely, for instance, that geomagnetic fields would change significantly across the time period for taking the measurements. Although this is a valid

[2]It might be argued that in a recent study Wiseman et al (2002) did use two magnetic sensors running at approximately the same time. However, in that study the data from both sensors were never formally compared together and no detail was given as to how these were time-linked. Furthermore, no information or figures were presented that provided detail concerning the signal shapes between the sensors (see Figures 2 to 5 here). The main focus of that study was to link magnetic anomalies (high fields and variance) to questionnaire responses. Therefore this remains the first study to employ and formally compare two independent and highly detailed magnetic data series, over a prolonged time period in this manner.

point, it is important to note that geomagnetic fields are not the only contributor to the magnetic environment, and these other electromagnetic fields can vary considerably over space and time. Furthermore, it is not always clear from the literature what the overall time periods were for recording sessions and for the measurement period overall so this is often difficult to ascertain from the studies available. Nevertheless, it would seem that a time-synchronised baseline would be the most useful, effective and conservative test of magnetically remarkable locations.

To summarise, previous studies have attributed what may be a time-based variable component in the magnetic signals to a space-based variant characteristic between haunted and non-haunted areas. However, the difference may simply reflect a change in the fields present across time, not space. This of course is still important and interesting but the only way to disambiguate these factors is to take time-linked recordings from sensors occupying different spatial locations. Only then can one really compare differences across areas and claim that levels or variances truly are different in some manner.

Motivation of the present study

The present study was designed to investigate the general claim that locations associated with haunt-type experiences may be magnetically remarkable in some way. Furthermore, as a number of studies have associated some magnetic anomalies to such environments, it seems reasonable to assume that there may also be a relatively constant *undercurrent* of fields that could be of interest at these locations. However, unlike prior studies, here a new system that employed a time-linked baseline recording was used to gather detailed time-series data of the magnetic environment over space and time (this system is outlined below). Note that the claim that 'haunted locations' may either contain higher than normal, or more variant than normal, magnetic fields has often been made in relation to field amplitude measurements (Persinger & Koren, 2001; Persinger et al., 2001; Roll & Nichols, 1999; Roll & Persinger, 2001; Roll, Moody & Radin, 1996; Wiseman, et al., 2002, 2003). In line with this, the present study concentrated on providing detailed field amplitude data (e.g., overall levels and variances). It is worth noting that an important area of future study would be to evaluate field frequencies (also a source of complexity) associated with the amplitudes measured. Nevertheless, of the studies that do evaluate field amplitudes, a detailed time-linked baseline analysis capable of disambiguating potential space-based and time-based magnetic anomalies has not been carried out. This was the purpose and context of the present study.

The study was carried out at *Muncaster Castle*, Ravenglass, in Cumbria, England. This location has been actively investigated exclusively by the author since 1992. It represents one of the longest running continued field investigations into a haunting ever carried out. A detailed review of case events is beyond the scope of the present article, suffice to say the following: over the course of investigation numerous eyewitnesses have been interviewed and their testimonies evaluated, many site examinations have taken place, and field-based investigations have been carried out continuously since 1992. Although striking experiences have been reported in a number of areas, the longitudinal research has revealed that a definite epicentre is the Tapestry room (TR) located on the first floor in the Castle. This was chosen as the room of interest for this study.

Data gathered from the research project carried out by the author (JJB) has revealed that eight reliable eyewitnesses have reported extremely similar experiences from the same location (the sounds of children crying/secondary adult voices comforting the children). These particular experiences span from the early 1960s to the mid 1990s. None of these eyewitnesses were aware of the reputation of the haunting in the room (indeed the room was being used as a guest room at the time), or that other people had reported similar experiences at the time they had reported theirs. However, one curious fact that has emerged is that not only was the same room involved, but that six of the eight observers were all in relatively the same position in the room (settling down in the bed) at the time of the experience. Furthermore, a detailed analysis of their accounts revealed that they all claimed the phenomena was initially emitting from relatively the same distal location in the room (just to the right hand side of the window area; approx 5–7m away: this would be to the left of the observer if they laid on their backs in the bed). These somewhat unique experiences provide an ideal context with which to test for magnetic anomalies. Knowing the approximate body/head position of a number of crucial eyewitnesses allows us to investigate a relatively specific region for the presence of constant magnetic anomalies. For instance, if some of the TR experiences can be thought of, at least in part, as magnetically induced hallucination then one might suppose that perhaps such anomalies would be present around the head/pillow area of the bed in the TR. Arguably this represents a point in space where observers may have been exposed to stimulatory magnetic fields. This study sought to test this idea. There are four main issues related to magnetically remarkable locations that are important to the current study. These were touched upon earlier but can be summarised as follows:

1. That the overall magnetic field strength (amplitude) is greater at areas of interest relative to baseline areas.

2. That the overall field strength is not important, it is the way in which the fields vary (e.g., their complexity) that is crucial and defines these areas.

3. That it is a combination of both strength and complexity that distinguishes areas which produce experiences from areas that are not associated with strange experience.

4. To disambiguate potential space-based and time-based magnetic anomalies.

In relation to the present experiment, the first point would predict that the overall magnetic field would be much higher at the crucial pillow area than at the baseline area. The second point would predict that the variance (measured by standard deviation) would be greater at the crucial pillow area relative to the baseline area. The third point would predict that the pillow area would be distinguishable in both terms of strength and complexity relative to the baseline. Furthermore, a time-based anomaly could occur on one or both sensors, but would be revealed by continuous measuring with dual-sensors. Finally, quite different field amplitudes measured between the sensors would reveal an important space-based anomaly (across sensor locations).

Overview of the present study

To truly establish whether there is anything magnetically remarkable about specific areas where people have reported anomalous experiences, relative to baseline areas, a simultaneous time-linked baseline measurement must be taken. The present study is the first study ever to employ continuous dual time-linked magnetic measurements of a reputedly haunted location. This included a measurement from the area of high interest and a proximal synchronised baseline measurement.

The magnetic measurements for this experiment were carried out using the dual sensor *Magnetic Anomaly Detection System* (MADS). The MADS consists of two separate high-speed digital fluxgate magnetometers. The sensors are customised versions of the model 540 from Applied Physics Systems USA (see http://appliedphysics.com). One sensor is labelled as the Active sensor (Sensor A) and the other as the Baseline sensor (Sensor B). Each sensor can be configured to sample 250 times a second (every $4ms$) in three orthogonal (x, y, z) directions simultaneously (slower rates can also be selected) and independently. This provides a full 3-dimensional representation of the magnetic environment. These sensors are incredibly sensitive (down to 0.5nT) and capable of measuring both the AC and DC components of the magnetic field. The MADS sensors are interfaced to their own individual dedicated laptop PCs (Dell computers) via the serial port and are equipped with their own data acquisition software. The MADS is the most appropriate configuration to truly detail the nature of magnetic complexity in the natural setting.

The present study consisted of placing the Active sensor in the pillow region of the bed (simulating where approximately the observers head would be) in the TR and the Baseline sensor at some proximal distance from it in the same room (the area the voices were heard coming from). The data measuring duration lasted for a continuous 4 hours period in total. This period was subsequently decomposed into 4 separate 1–hour measuring sessions.

Method

Design & procedure

The study was carried out over the course of one evening from 11:30pm to 3:30am on the 31st March 2004 at Muncaster Castle, Ravenglass, Cumbria. Researchers present included the author (JJB) and fellow researcher Ian Topham (IT) who assisted in setting up the sensors and taking measurements. The *'Active'* sensor was placed just above the pillow area on the TR bed at a height of 110cm from the floor to the middle of the sensor. The midpoint of Sensor A was 35cm from the north wall (behind the headboard), and 170cm from the west wall that adjoins the staircase. These coordinates placed the sensor roughly in the middle of the pillow area and it was 120cm from both side lamp fittings either side of the bed. The *'Baseline'* MADS sensor (Sensor B) was placed at the same height from the ground as Sensor A, but located towards the opposite end of the bedroom to the right of the window location. The distance between the midpoints of both sensors was 514cm with Sensor B being placed diagonally southeast from Sensor A. Sensor B was 210cm from the east wall (containing the window and a wall mounted metal radiator), and 120cm from the south wall adjoining the next room. Sensor B was also approximately 160cm from the dressing table lamps near the east facing window wall (see Figure 1).

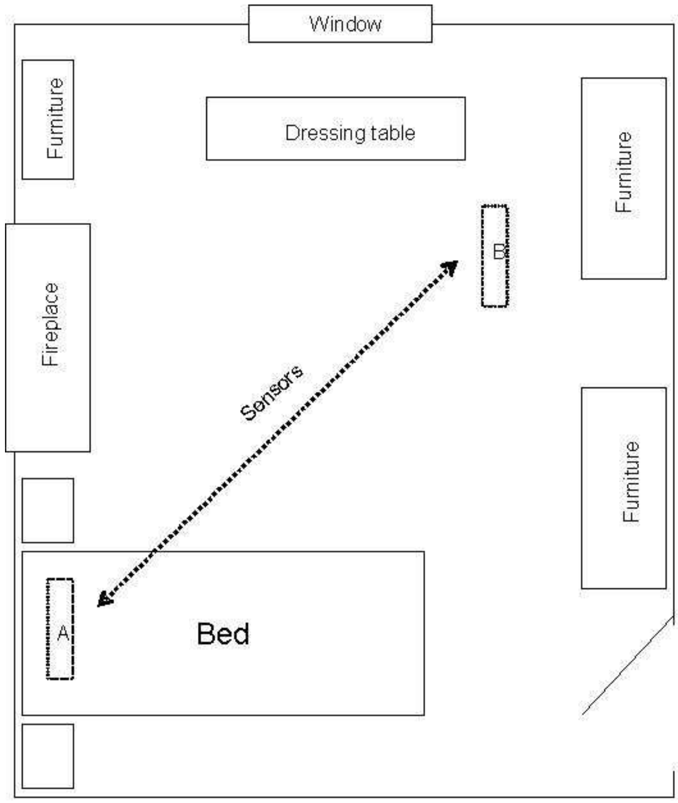

Figure 1. Schematic floor plan of the Tapestry room showing the room layout and sensor locations (A and B) for the study.

Each sensor was orientated (using a compass) so that the x-axis was pointing East/West, y-axis was North/South, and the z-axis Up/Down and were fixed so that the x and y axes were parallel to the floor. The calibration of the sensors was checked before the experiment began following guidelines from the manufacturer. The sensors were configured to gather data at a baud rate of 9600, which equated to a rate of 33 samples a second. These settings can be configured via the data gathering software provided by the sensor manufacturer. The clocks on both laptop computers were synchronised (using the internet) and the data files configured so that they provided a time stamp with every reading. Before the beginning of the experiment both sensors were placed together and a time-calibration test was carried out. This involved passing a low-strength magnet a few centimetres in front of the sensors, which produced a significant peak in the signals. These peaks were used in the data file for further time-based alignment calibrations. The measurement session lasted for 4 hours of continuous time-linked monitoring. All data gathered were recorded and stored automatically by the software on the laptop computers. In terms of nearby electrical devices, the room is only equipped with side lighting and these were left on. There were table lamps either side of the Tapestry room bed, and two lamps situated on either side of a dressing table near the window area. With the exception of the sensors, and a ceiling mounted fire alarm, these were the only electrical devices in the room (and a similar arrangement is employed in all adjacent rooms). No individual entered the TR during the measurement period.

Results & Discussion

The results were analysed in the following manner. The data files from both sensors were checked and matched for the time calibration test and edited down so each sensor master file now contained 4 hours worth of raw time-series magnetic data. Firstly, four separate time-linked one-hour session files were created for both sensors independently. Overall descriptive statistics were calculated on each sessions-worth of data. This included a mean total overall field value (AC and DC fields summed), a range, and a standard deviation for each axis (x, y, z). These values are summarised for each session and sensor in Table 1. This gives an initial indication of where and when the strongest fields and highest variances occurred. All values are given in nanoTesla (nT). Secondly, the data from both sensors for the full 4-hours was merged into one large data file. This file contained over 900,000 magnetic samples across the two sensors combined. Formal analyses were carried out on these data and the results are also given below.

Descriptive analysis

Table 1 suggests the following, firstly there seems to have been a large and clear difference in total field values gathered from the different locations. Sensor A (pillow area) provided an overall value of 30491nT whereas Sensor B (window area) produced an overall field of 77857nT (a difference of approximately 47366nT). This difference is considerable

Table 1: Descriptive statistics and averages for both Sensor A and Sensor B for all four sessions (one hour intervals). All values are given in nanoTesla (nT).

		Sensor A			**Sensor B**		
		Mean	Std Dev	Range	Mean	Std Dev	Range
	Mag X	10873	00057	00372	24597	00031	00232
Session 1	Mag Y	-17205	00027	00174	09065	00008	00052
	Mag Z	-22702	00016	00100	73302	00011	00076
	Mag Total	30491	00015	00108	77848	00012	00087
	Mag X	10870	00055	00366	24566	00029	00199
Session 2	Mag Y	-17201	00027	00192	09077	00007	00043
	Mag Z	-22701	00015	00103	73317	0007	00061
	Mag Total	30489	00014	00103	77855	00010	00068
	Mag X	10869	00055	00345	24544	00029	00226
Session 3	Mag Y	-17197	00028	00177	09079	00007	00040
	Mag Z	-22711	00015	00098	73333	00007	00061
	Mag Total	30491	00015	00092	77860	00010	00076
	Mag X	10870	00053	00348	24528	00028	00222
Session 4	Mag Y	-17194	00027	00202	09082	00007	00043
	Mag Z	-22716	00014	00092	73339	00006	00055
	Mag Total	-30493	00013	00086	77864	00009	00064

for such a short spatial distance (less than 7m). There were also some interesting differences across the planes. For both sensors, the *z*-axis (up/down) contributed most to the overall field amplitude level, this being 74.5% of the total field for Sensor A, and 94.2% for Sensor B. This is to be expected given the dip in the Earth's magnetic field at the latitude and longitude of the building.

Within each sensor, the highest standard deviation and range came from the *x*-axis (East/West). This may indicate that both sensors were picking up on a general and more global variance from these directions. However, the range of values from the *x*-axis was far higher overall for Sensor A (358nT, standard deviation = 55nT) relative to sensor B (220nT, standard deviation = 30nT). Between the sensors, the biggest difference seems to have come from the *y*-axes (north/south) with the variance being much higher for Sensor A. To summarise the descriptive analysis, Sensor B (window area) produced the total highest background field readings. However, Sensor A (pillow area) measured considerably higher variance in the magnetic field when decomposed across the axes. The significance of these differences were analysed more formally below.

Formal analysis

The patterns revealed by the descriptive analysis were more formally analysed in the following way. Firstly, a 2 x 4 (Sensor x Session) between-subjects Analysis of Variance (ANOVA) was carried out with the total-field magnetic measurements as the dependent variable. The ANOVA was based on mean averages taken every 15mins throughout the measuring period (4 hours) for both sensors.[3] This revealed a significant main effect of Sensor, $F_{(1,24)} = 8.8, p < .001$. As suggested by the descriptive analysis, the fields measured by Sensor B were significantly higher than those from Sensor A. The analysis also revealed a significant main effect of Session, $F_{(3,24)} = 17.9, p < .001$. The sessions produced reliably different field patterns over the 4-hour measuring period. The Sensor x Session interaction was also significant, $F_{(3,24)} = 10.5, p < .001$. This last result was probably due mainly to an overall rise in field amplitudes of around 25nT for Sensor B, relative to a rise of only 5nT for Sensor A, over the measuring period. Figure 2 shows total field data from Sensor A and Sensor B averaged for every half-hour for over the 4-hour period. Here the differential increase for Sensor B can clearly be seen.

The ANOVA carried out on the total magnetic measurements revealed significant differences based on the measured samples of the total combined magnetic field at both locations in space. The nature of these fields were decomposed and explored further by comparing the actual variances of the separate *x*, *y*, *z*-axis magnetic series themselves. The descriptive statistics summarised across Table 1 suggest that the most variant fields measured occurred during Session 1 for both sensors (indicated by the increased standard deviations and range). If field variance is important then a crucial difference may exist between the variance in the signal from the separate individual axes of Sensor A compared to the time-linked axes of Sensor B. To test this, the variance was compared between the separate axis measurement from Sensor A

[3]One might argue that the use of parametric statistics is questionable here as magnetic signals are known to be non-stationary and produce non-normal distributions. However, there are a number of ways of correcting for this. To cater for this, the present study here summarised and averaged the raw signal samples into overall means for particular time periods (i.e., every second or every 15mins). These averages are known to be normally distributed (mean sample distribution) and are suitable for such an analysis (see also Wiseman et al., 2002, 2003 for a similar procedure).

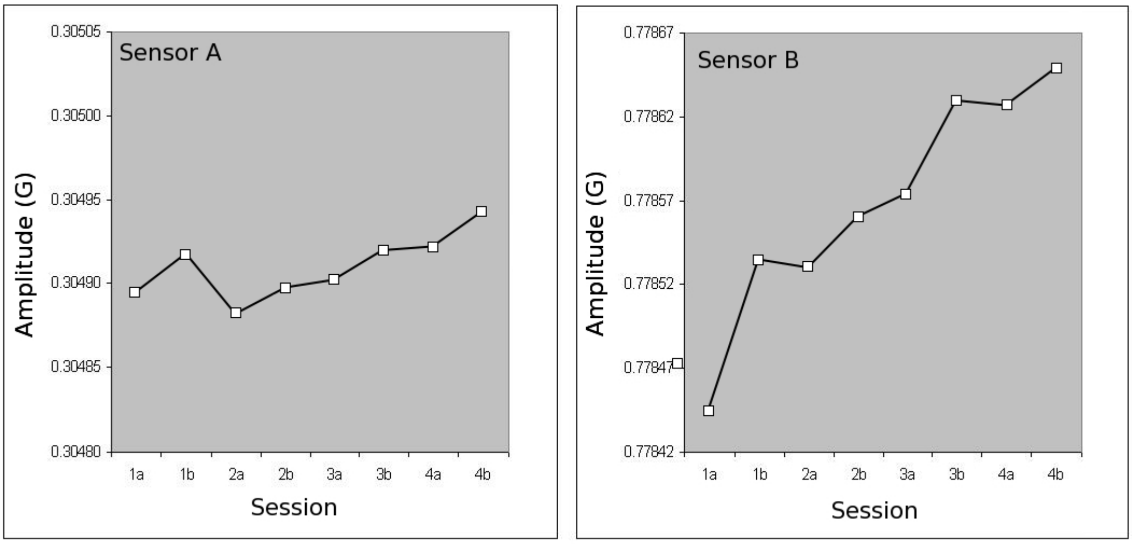

Figure 2. Total magnetic field measurements averaged over 30min segments from each session for both Sensor A and Sensor B. Here the clear increase in total amplitude for Sensor B, but not Sensor A, can be seen. Note for simplicity and comparison, the y-axis on this and subsequent figures is set for increments in Gauss (G). To obtain the correct value in nT simply read the value from the right of the decimal point.

and Sensor B for session 1. This was done by averaging the raw sample series into 1 second means for 120 seconds of time (2 mins) at the beginning of session 1.[4]

This was carried out separately for the x-axis, y-axis and z-axis on both sensors. A F-ratio was then calculated on these measurements by dividing the variances computed from the sensor data. This revealed a significant difference between the variances for both the x-axis ($F_{(119,119)} = 3.3, p < .001$) and y-axis ($F_{(119,119)} = 9.9, p < .001$) of Sensor A relative to Sensor B. The difference between the z-axis on the two sensors just failed reach significance ($F_{(119,119)} = 1.9, p > .05$. These results confirm the idea that the magnetic variance measured by Sensor A was, on the whole, much greater and statistically distinguishable from that obtained by the baseline sensor. The majority of this difference in variance came from the comparison between the y-axis (north/south) and the x-axis across the two sensors. Figures 3 to 6 show the time-linked signals compared between the sensors for the three axes separately and the total combined field. These signals are based on 184 raw samples, which equated to approximately 5 seconds taken from the start of ses-

[4]These comparisons were also carried out at other random sections of the data series at approximately 30mins (mid point) and 60mins (the end) of session 1. The results remained the same as those formally reported. For reasons conciseness we do not report these further replication comparisons.

sion 1. The increased amplitude variance and complexity in the signal from Sensor A can clearly be seen relative to the time-linked simultaneous baseline signal (Sensor B).

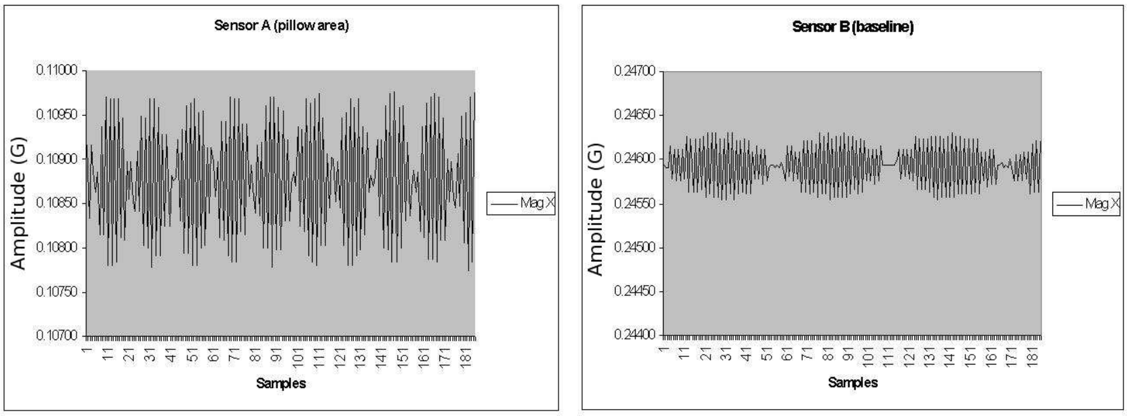

Figure 3. Time-linked signals from the *x*-axis only from Sensor A and Sensor B. These signals, and subsequent ones, are based on 184 samples, which equated to approximately 5.2 seconds taken from the start of session 1.

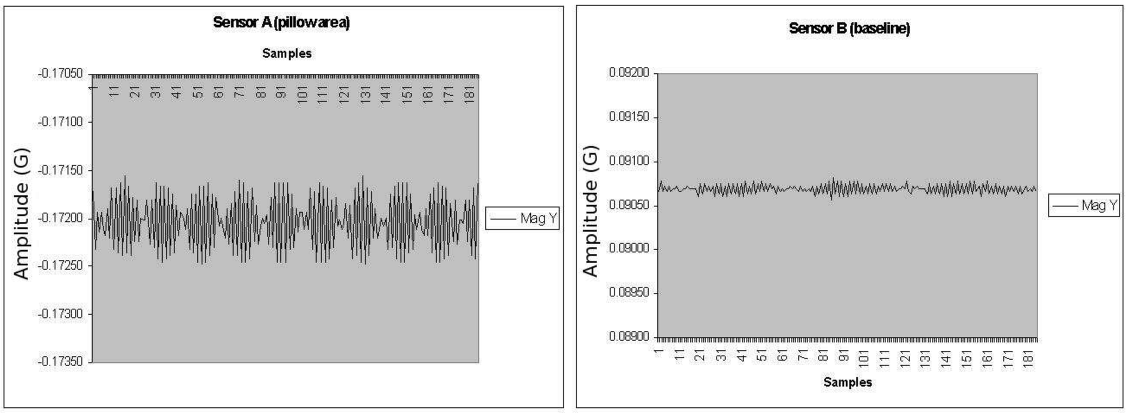

Figure 4. Time-linked signals from the *y*-axis only from Sensor A and Sensor B.

To summarise the formal analysis, as well as there being an overall significant difference between the amplitudes measured from the two spatial locations, there was also a strong reliable difference across the sensors in the time-based varying component as well. Finally, although a detailed analysis of frequency components is beyond the scope of the present article, a preliminary examination of the signals for session 1 revealed a small but continuous peak at 7Hz to 8Hz (picked up in both *x* and *y*-axes) from the pillow area. This peak was absent from the baseline

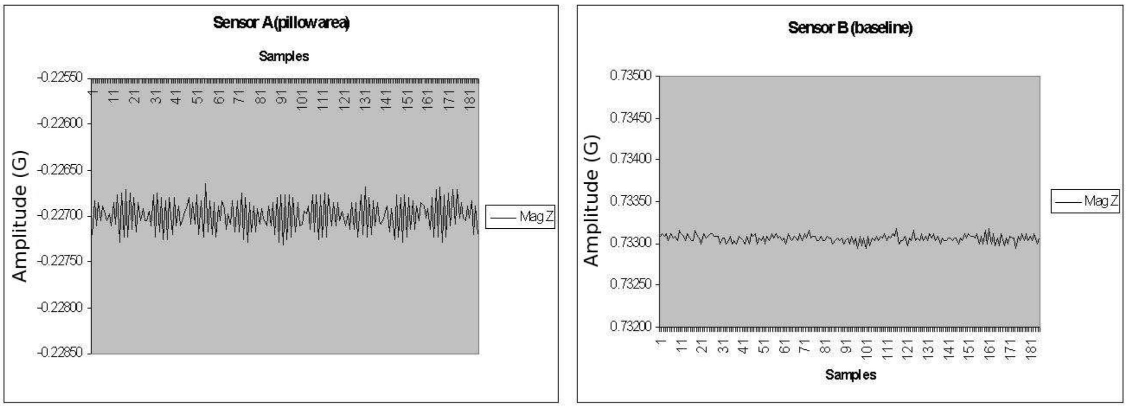

Figure 5. Time-linked signals from the *z*-axis only from Sensor A and Sensor B.

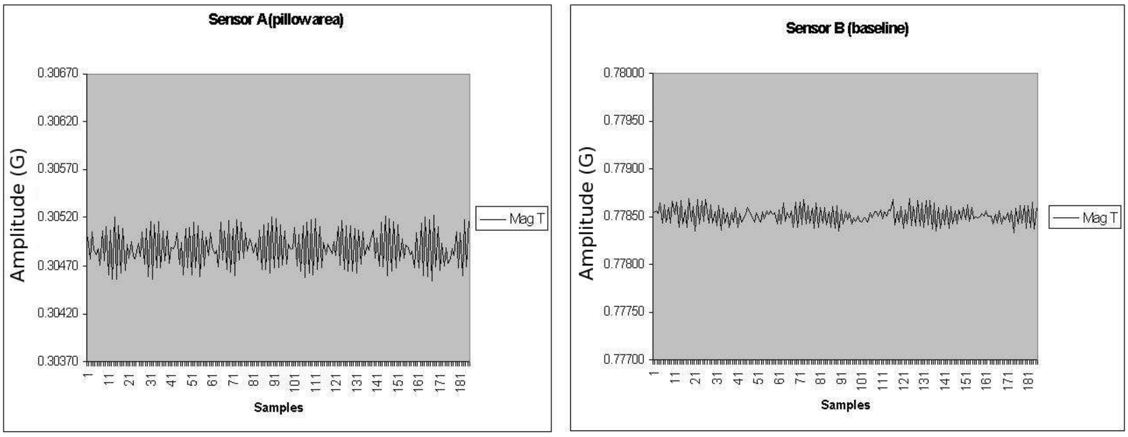

Figure 6. Time-linked signals for the total magnetic field (*x,y,z* combined) measured from Sensor A and Sensor B.

signal. One suggestion could be that this frequency component could be related to natural Schumann-type resonances generated in the Earth's atmosphere. However, if this is the case it is odd that it was only picked up in the pillow area. A full and detailed examination of frequency components throughout the measuring session will be the subject of a future article.

General Discussion

It has been claimed that some haunt-type experiences could be associated with magnetically remarkable environments (Nichols & Roll, 1998, 1999; Persinger et al., 2001; Persinger & Koren, 2001; Roll & Nichols, 1999; Roll & Persinger, 2001; see Persinger & Koren, 2001; Roll & Persinger, 2001 for reviews). The implication is that perhaps these environments can stimulate labile brains and induce strange experiences in observers. The idea that such locations could contain neurophyiso-logically relevant magnetic anomalies is attractive as it provides a useful and, most importantly, testable framework. However, one problem with studies so far carried out in the natural setting is that none have employed detailed magnetic surveys over separate spatial locations using simultaneous time-linked baseline recordings. The present paper outlined the first experiment to use a high-speed time-linked and synchronised baseline sensor to evaluate magnetic components at specific locations of interest. This has provided the most conservative and detailed test of magnetic anomalies and reputedly haunted locations carried out so far.

The location chosen to test the idea has produced numerous anecdotal spontaneous experiences of striking similarity. An analysis of these testimonies revealed an epicentre (the TR) and area within in it (the pillow area of the bed) that could be of prime interest. The present experiment consisted of placing a sensor approximately where the experient's head would have been, and placing the baseline sensor at the location where witnesses have reported the crying and sounds originated. This experiment revealed significant spatial and time-based differences in the nature of the magnetic fields measured across the sensors. These differences and their implications are outlined below.

Amplitude levels

The average steady-state strength for the earth's geomagnetic field is between 48000nT to 50000nT (.480mG to .500mG). Average hourly time-based variances in this field are typically in the region of 1 to 10nT. Although local geological factors such as tectonic strain, quartz-based rock and magnetic mineral properties can greatly influence the spatial distribution of magnetic anomalies (see Roll & Persinger, 2001), an accepted average is around 5nT per kilometre. Keeping these figures in mind, it is clear that both sensors measured fields vastly outside these estimates. In relation to the overall expected amplitude average, Sensor A provided a much lower overall measurement and Sensor B a much higher one. Furthermore, a large spatial difference occurred between the sensors in the region of 47000nT. Although other field studies have also demonstrated excessive spatially variant and distributed GMFs in the 10000nT to 40000nT range, these are more typically distributed over larger distances than those reported here (see Nichols & Roll, 1999;

Persinger & Koren, 2001; Roll & Nichols, 1999; Roll & Persinger, 2001).

One reason for the very low amplitudes measured in the pillow area could be related to the dense metal lattice mattress support under the central area of the bed itself. This could be artificially causing a constant distortion in the ambient magnetic field reducing the overall amplitude in the pillow region (note the dense metal fixtures are not in the pillow region itself but cover an area consistent with the upper back to ankle region on the beds occupants). To test this we also took some preliminary measurements above the mattress around the central bed area where we did measure a substantially high and constant field of around 96457nT (the highest field encountered). This is considerably above the natural geomagnetic field. However, approximately 90cm from this position in the pillow area the field dropped dramatically to around its average of 30491nT (a difference of around 60000nT!). Irrespective of the underlying mechanism it is clear that occupants of the bed are exposed to a highly spatially variant field with ambient levels around the torso area that were double that of normal levels and almost three times that of the pillow area. A full and detailed spatial survey of the TR, bed area, and other baseline rooms is planned for the future to ascertain the nature of the spatial variance in these magnetic fields, the distortion the bed may be causing, and attempt to locate a source.

The overall high field readings from Sensor B are most likely due to the net influences of the localised geophysics and the longitudinal/latitudinal position of the location. The castle is built out of thick granite and sandstone rock and is located on a dense granite plate covering a small area of the Eskdale valley region of West Cumbria. As noted earlier, some research has suggested that rock structures that contain magnetic minerals are associated with higher than normal background magnetic fields (see Persinger & Koren, 2001; for a discussion). This may be a contributing factor here. Alternatively, the high field may be related simply to the dip in the Earth's magnetic field at the latitude and longitude of the building. The suggestion that the castle contains higher than normal ambient levels was confirmed when other preliminary measurements were taken on the ground level of the castle in three rooms, the Guard room, the Great Hall and the Library which produced steady ambient fields of 86538nT, 86532nT and 86527nT respectively.

Another possibility for the generally high fields measured by Sensor B could be due to EMF contamination from man-made sources into the general background ambient field. This could have the effect of artificially increasing the background field far above that of geomagnetic expectancies. However, although possible there are a number of reasons why this does not seem crucial here. Firstly, the fields measured were far higher than those reported in many normal homes that arguably use more modern electrical appliances over a more condensed area. Secondly, it is also unlikely that such high fields should occur in a castle in the middle of the night when electrical use should be very low. Furthermore, the FFT carried out on data from session 1 only revealed a very small frequency component at 7Hz, which is far too low to be coming from internal house wiring, etc. This demonstrates that the variance in amplitude was generally distributed throughout the frequency spectrum, indicating a more natural source. Therefore, although such contamination could occur under certain circumstances, there seems to be little evidence of it here in the present data. This possibility remains to be more directly assessed in future studies. However, irrespective of the potential contributing sources to the field characteristics, what these findings illustrate is the nature of the magnetic environment within which observers are reporting experiences.

Although the exact role of these high constant background fields in relation to strange experiences is open to debate, it is important to quantify the fields that are present. However, it is also important to note that the current data clearly show that they do not exclusively typify the TR. Much higher fields have been measured on the ground floor (with the exception of the bed measurements due to the fittings mentioned above). Of course, experiences have been reported from many areas of the castle but it seems unlikely that constant high amplitudes alone are crucial for the main TR experiences reported here. Indeed, the pillow area seems to have produced the lowest strength fields measured so far. Irrespective of the merits of this suggestion, what seems more crucial for these experiences is how the fields varied over time.

Magnetic variance

The geomagnetic field typically varies slowly over the 24-hour cycle. Time-based variances of around 1 to 10nT are usual, though variance as much as 300nT can occur during magnetic storms or solar activity. Some researchers have suggested that gradual increases of around 20nT – 50nT in GMFs can be associated with haunt-type experiences and reports of a *'sensed presence'* (Persinger, 1975, Persinger & Koren, 2001; Persinger & Richards, 1995). Some animal studies have also shown that overt occurrences of limbic motor seizures increased significantly when a 7Hz amplitude-modulated magnetic field varying between 10nT to 50nT were applied for two hours duration (Michon & Persinger, 1997). Note the preliminary frequency analysis here revealed a small 7Hz to 8Hz field in the pillow area alone.

In the present study, over the course of the 4-hour measuring period, the total combined magnetic field measured in the window area increased more than the combined fields measured in the pillow area (25nT versus 5nT). The difference in the increase between the sensors was significant. The smaller increase at Sensor A is consistent with the field distortion idea mentioned above, where amplitudes may be artificially reduced in the pillow area (or biased away from it) due to nearby fixtures and fittings in the base of the bed.

However, perhaps more interesting was when the total field was decomposed into the individual axes analysis. This revealed that the time-based variances in the magnetic fields measured in the pillow area were substantially and significantly higher than the variances measured in the window area (except for the z-axis). The majority of this increased variance came from the y-axes and x-axes (north/south and east/west respectively). For instance, during Session A the range of readings for the x-axes from the pillow area was 372nT compared to 232nT from the window area. For the y-axes it was 174nT versus 52nT. This distribution of measurements for the pillow area is high and far exceeds the normal expectations of variance for these natural signals outlined above. Even if we assume a further degree of increased variation due to the geophysics of the area, a field varying in hundreds of nT is still unpredictably high. The cause for such variance remains unknown but it did appear to be a relatively constant factor in the fields measured at that time indicating that it may be a 'natural' or at least more constant component of the fields in this specific location.

These findings are consistent with prior studies suggesting that it is field complexity (defined here as variance in amplitude) rather than amplitude levels *per-se* that may be crucial for eliciting some haunt-type experiences (Persinger, 1999a, 1999b; Persinger & Koren, 2001; Roll & Persinger, 2001; Wiseman et al., 2003). Furthermore, this study expands previous findings by showing that such complexity is potentially available in a crucial region of the room. The difference noted earlier between the sensors showed an important spatial difference in the amplitudes of the fields measured. In contrast, the temporal variances in the signals show that potentially important time-based transients do exist at such locations.

Magnetically remarkable locations

It is clear from the data gathered overall that the general level of ambient magnetic field measured at Muncaster Castle is much higher than the estimated geomagnetic averages for the country. This could be due to the combined and net influences of the local geology of the area, the material the castle is built out of, local tectonic characteristics, and possibly contributions from diffuse artificial EMF sources (e.g., house wiring etc) impinged upon a geomagnetic field. Although the source of such elevated fields is currently unknown, they are a constant characteristic of the rooms so far measured in the locale. The effects of constant exposure to such increased field strengths on neuronally susceptible people are currently open to debate. The presence of such increased fields is consistent with a number of previous studies suggesting that static fields of these amplitudes and their spatial distribution could be critical for strange experiences. Coupled to these high levels, the evidence presented here also suggests that highly variant temporally defined fields are also present and may well differentiate certain areas.

In relation to the four questions outlined in the Introduction the data suggest the following: Firstly, there seems to be no evidence here that the pillow area contained excessively high fields, either relative to the baseline or the Earth's expected average field strength. Indeed, quite the contrary. However, there was clear evidence that the general ambient fields available elsewhere in the room and castle were higher than those predicted by national averages. There also seemed to be little evidence that high amplitude fields and high variance co-occurred at the same specific sensor position. The highest amplitudes produced the lowest varying fields, and conversely the lowest amplitude fields produced the highest varying (i.e., more complex) fields. If we assume that such complexity is crucial for inducing hallucination then there was clear evidence here that the fields around the head/pillow area of the TR were far more complex and time-varying relative to the time-linked baseline (see Figures 2 to 5). Furthermore, the use of dual sensors has revealed both a time-varying and space-varying difference across the areas surveyed. The large difference between the overall amplitudes is consistent with the notion that reputedly haunted locations may contain highly spatially variant fields (Nichols & Roll, 1999; Roll & Nichols, 1999; Roll et al., 1996; see Persinger & Koren, 2001; Roll & Persinger, 2001 for reviews). Indeed not only was a large difference present between the two main measuring positions, but when a preliminary survey of the bed region was carried out this produced both the highest and lowest amplitude fields over an approximate 90cm distance. Clearly the occupant of the bed area would be exposed to such diverse fields. Furthermore, the time-based measurements across both sensors revealed that although some highly variable magnetic components were influencing both sensors in the same directions (perhaps reflecting local peculiarities in the ambient field of the building) the effect was far greater in the pillow area of the TR. Note that the capacity to disambiguate these time-based and space-based magnetic components would not be possible with a simple single meter or single sensor approach.

If the signals reported here are in any way indicative of the important magnetic characteristics that distinguish haunted locations from non-haunted ones, then it would seem to be the case that there is a constant general 'undercurrent' or signature to them. In other words, these fields or some component of them may be 'available' all of the time. The magnetic properties that characterised the two sensor locations seemed to remain relatively constant over the 4-hour measuring period. This implies that occupants of the bed would, at least in principle, be exposed to the complex field over a more prolonged time period. Whether these 'undercurrents' are sufficient, a change in their magnitude occurs, or a completely different magnetic signature become apparent during anomalous events/experiences remains to be seen.

To summarise, the present study has employed new high-speed technology and a time-linked baseline methodology to assess the magnetic characteristics of a reputedly haunted location. The present study has allowed for the detailed comparison of two areas over precisely the same time periods. This is the first field study of its kind to constantly measure, over a prolonged time period, the nature of magnetic variance at such locations in this manner. This approach places this study much closer to the findings from laboratory studies of magnetic brain stimulation. If laboratory studies are correct then magnetic anomalies should exist at locations of interest, and specific areas within them. Based on the present data, the magnetically remarkable signature of Muncaster Castle has highlighted a spatial disparate and temporally complex amplitude varying magnetic field. Although the exact source of the field is unknown, the crucial initial step is to demonstrate that such anomalies exist in the first place. Further studies are planned to carry out detailed time-based and spatial magnetic surveys of the location to evaluate the implications for strange experiences in a promising contemporary case of a haunting.

Acknowledgements

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Arousal and Performance at ESP and PK Tasks Using A Common Protocol

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Abstract

This paper describes the third study of a series of four designed to explore the relationship between ESP and PK performance by testing for both using a common protocol so as to control for expectancy effects and experimental artifacts. Following earlier work (Roe, Davey & Stevens, 2003, in press), we were particularly interested to gauge the effect upon performance of participant arousal levels in view of contrasting prior research looking at ESP and PK separately. Forty participants completed a computer-based greyhound racing game. Races occurred in two blocks of 12. One block was presented as an ESP task and required participants to nominate which of the six greyhounds had won a race that the computer had already run silently. The program then replayed the race as feedback. The other block was presented as a PK task and required participants to 'will' a greyhound that was selected for them to run faster than its competitors. The greyhound's movements were determined in real time by an RNG. However, within each block half the races were in fact ESP trials and half PK trials, presented in random order. Participants were randomly allocated to one of two conditions; in the increased arousal condition participants were instructed to actively engage with the task and listened to selected pieces of up-beat classical music, while in the decreased arousal condition, participants were told to relax and take a passive approach to the task while listening to a peaceful relaxation tape. Overall performance was non-significantly above chance for both ESP and PK trials and there were no significant relationships between outcomes in the four conditions.

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Introduction

It is very difficult to assess whether the phenomena labelled as extrasensory perception (ESP) and psychokinesis (PK)[1] reflect aspects of a single underlying phenomenon or are ontologically distinct. This is in part because relatively few attempts have been made to compare the performance of participants at ESP and PK tasks (Roe, Davey & Stevens, 2003, in press). Where characteristic patterns of performance have been identified for one domain they may not have been studied in the other. Comparisons between ESP and PK functioning are made more difficult because the mode of testing for ESP is typically quite different from that for PK so that apparent differences in the preferred conditions of the phenomena may be artifacts caused by situational factors (Schmeidler, 1988). We have recently described a new protocol using a computer game interface that allows both phenomena to be tested for within exactly the same context. In the game, RNG and pseudorandom data were sampled to determine the movements of six greyhounds from the left to the right of the screen, simulating a race. The program monitors progress and notes the order in which the dogs cross the finishing line. In the ESP condition a race had been run 'silently' so that the outcome was 'known' to the computer. Participants are informed that their task is simply to select one dog from among the six that they felt had performed best on that trial. They then watch a replay of the race and the result is confirmed. In the PK condition the race would be run in real time with the movements of their pre-selected greyhound determined by a random number generator, and so theoretically susceptible to influence (Radin & Nelson, 1989).

To date, results with this new method have been somewhat disappointing. One aspect of the protocol that was identified as potentially contributing to poor performance was the mechanism by which decoy greyhounds are controlled in PK trials. In both previous studies during PK trials the target greyhound's movements were determined by the RNG, but the movements of the control greyhounds were determined using pseudorandom data already saved as data files. This therefore allowed for races in which the RNG might have been influenced in the intended direction, but for this not to be translated into a win or place for

[1]ESP here refers to instances in which persons appear to acquire information from their environment in some way other than through the known sensory channels, and PK refers to instances in which persons appear to be able to influence physical systems in their environment in some way other than through the known motor channels.

the target dog if the control dogs happened to also 'run quickly' on that trial. Similarly on some trials where the RNG output had not deviated from chance as intended, the target dog may well still have won or finished placed if the data for control dogs caused them, in relative terms, to 'run slowly'. Clearly there may not have been a direct relationship between participants' success in influencing the RNG and their performance in the races they witness – in Study 2, the correlation between participants' sums of ranks for PK trials and overall sampled RNG output was -.624, which was significant ($p < .001$) but meant that RNG output accounted for only 38.9% of the variance in combined sum of ranks scores for Disguised and True PK trials. In the present study we intended to address this by having the movements of both target and control animals determined by the same RNG in real time. Although this seems to require a PK effect of exquisite precision, there is a precedent for such a protocol (Hansen, 1990).

Across the series of studies our intention was to consider whether a number of factors that have been suggested previously to have similar or distinguishing effects on ESP and PK performance could give replicable patterns that might give some insight into the character of ESP and PK functioning. One suggested point of difference concerns arousal. It is generally believed that relatively low levels of autonomic arousal are ESP conducive (cf. Honorton, 1977). However, when Braud (1981, 1985) looked at reports of gifted PK subjects, many described high autonomic arousal during successful PK tasks. Although not always a reliable indicator of underlying physiological activity, states of suggested muscle tension seem to give rise to superior PK performance when compared with relaxation (Honorton & Barksdale, 1972). It is important to be clear about what is meant by 'arousal' in this context. Gissurarson (1997), for example, notes that some induction techniques that have been found to facilitate ESP performance, such as meditation, have also been effective in PK studies, suggesting that mental noise may still be inhibitory. Clearly, physical relaxation and mental stillness should not be regarded as equivalent. In this study we planned to consider the effects of physiological arousal upon performance at ESP and PK tasks.

Method

Design

This study incorporated a 2 x 2 x 2 mixed design looking at the effects of task type (ESP versus PK), briefing (informed that the task was ESP versus that it was PK), and arousal (whether participants are instructed to relax and listen to relaxing music or instructed to play an active role and listen to more rousing music) upon the finishing positions of selected computerised greyhounds in a game format. The first two of these independent variables (i.e. task type and briefing) involved repeated measures comparisons, while the last (arousal) involved independent samples comparisons. The primary outcome measure was pre-specified to be the weighted sum of ranks of finishing positions. We also intended to conduct exploratory correlational analyses to determine whether task performance in the four conditions covaried systematically with personality and attitude variables. All analyses were planned to be nonparametric and two-tailed.

Materials and apparatus

A participant information form (PIF) was constructed which asked about basic biographical and contact details. The PIF incorporated a version of Thalbourne and Delin's (1993) Australian Sheep Goat Scale (ASGS, adapted after Roe, 1998); the Keirsey Temperament Sorter (Keirsey & Bates, 1978) a variant of the Myers Briggs Type Indicator; and the Trait form of Spielberger's (1983) State-Trait anxiety inventory (STAI). The PIF is a generic form that also includes various other questions (e.g., about hypnagogic/hypnopompic experiences) that were not planned to be a focus of this study. Copies of the PIF are available on request from the first author.

Geomagnetic activity was measured using the K index, a baseline-corrected measure which represents the largest range of local activity measured in a 3 hourly period. It has a range from 0 to 9, with each digit indicating activity which is approximately a factor of 2 greater than the previous digit (Parkinson, 1983). Geomagnetic activity data for the United Kingdom are provided by the British Geological Survey via their web site (http://www.geomag.bgs.ac.uk/gifs/k_indices.html). Data from Hartland, the closest site to Northampton to provide K indices, were used in this study and were gathered after all trials had been completed.

This study used a computer program developed by Paul Stevens that incorporated a psi task in a greyhound racing game. A full description of its operation is given in earlier publications (Roe et al., 2003, in press). The program consists of 24 races, altogether taking approximately 12 minutes to complete. Races are run in two blocks of 12 races that ostensibly are either tests of ESP or PK. In fact within each block half the trials are of ESP and half of PK, presented in random order.

A tape recording was made of the participant instructions[2] followed by classical music that reinforced the experimental manipulation; for the relaxed condition participants heard Pachelbel's *Source to Sea*, whereas for the aroused condition, participants heard a selection of movements from Vivaldi's *Four Seasons*.

Participants

Forty people participated in this study, of whom 32 were males and 8 female, with a mean age of 26.8 years (SD = 7.7; Mdn = 25). Participants were drawn from an opportunity sample and so consisted mainly of friends and colleagues. Although some were undergraduate students studying at University College Northampton, the majority of the participants were drawn from the wider community.

Procedure

Prior to the session, participants were given the PIF to take away and complete at their convenience. They were greeted by the second author (RD) who acted as experimenter. If participants had not completed the PIF they were given time prior to their trial to complete it or to ask questions about items. They next completed the State form of the STAI, which was administered separately.

Participants were then escorted by RD into a research cubicle containing a PC with the program ready to begin and the nature of the task was explained to them as follows; You will watch 24 races in which six greyhounds race across the screen from left to right. On some trials the computer will choose a dog for you and labels it on-screen as 'you'; your task will be to 'will on' that dog to win the race. On other trials you are free to choose a dog by simply picking a number from 1 to 6; for these trials, the race will already have been run so your task will be to guess which dog has won. Instructions are given to you on screen

[2]We would like to express our thanks to Louise Jackson for reading out and recording to tape the standardised instructions.

as you run through the program. RD spent time with participants to ensure they understood the instructions and to answer any questions they might have. At this point the participant put on the headphones of a personal stereo system and a tape was played that gave condition-specific instructions for how to complete the task. For the arousing condition these were:

> "Welcome and thank you for agreeing to take part in our research. This part of the session takes about fifteen minutes to complete and is very simple to run. Simply follow all instructions on screen to run each race, and try to make as much virtual money as you can. For success in a test like this it is important that you are as motivated as possible. Really try to engage with the task and imagine that it really is your money at stake. Try not to allow yourself to get too relaxed. Try to feel as energised as possible. Feel your muscles tensing up as you prepare for action. Clench your fists. Feel the energy in your body. Really try to get into the races, strongly willing your dog to get across the finish line first. Feel free to shout at the screen while you watch the races and listen to the music! Press the space bar now and start cheering on your dog. Good luck."

For the relaxation condition the instructions were:

> "Welcome and thank you for agreeing to take part in our research. This part of the session takes about fifteen minutes to complete and is very simple to run. Simply follow all instructions on screen to run each race, and try to make as much virtual money as you can. For success in a test like this it is important that you are as relaxed as possible. Try not to worry about the outcome or think too much about what you should do. Simply adopt a passive, relaxed approach. Let the events just wash over you. Stay relaxed and calm. Place your hands in your lap and loosely clasp them. Take a deep breath – and again. Your arms are now relaxed, completely relaxed. Every muscle in your arms is relaxing completely; just let them go limp. They are so relaxed that you are beginning to lose all feeling of them. Your entire body is completely relaxed. You will remain completely relaxed throughout these runs; peaceful and relaxed. You can now begin the game by pressing the space bar whenever you are ready."

In each case the tape went on to play, respectively, invigorating or relaxing classical music continuously until the end of the experiment. All the subsequent stages of the study were administered by the computer program once it was started; participants were presented with a series of 24 races in two blocks of 12. One block was labelled as 'gambler' races and consisted of ostensibly ESP trials. Here participants saw the onscreen briefing: "For the next 12 trials we'd like you to play the role of a gambler who has a free hand to choose which dog to select. In this session the races will already have been run by the computer but not yet have been played out. Your task is to use ESP to identify which of the 6 dogs won the race. Once you've made your choice you'll see a replay of the race on screen." Prior to each gambler race, participants were prompted to enter a number from 1 to 6 corresponding to their choice of dog for the forthcoming 'replay'. A second block was labelled as 'owner' races and consisted of ostensible PK trials. Here the onscreen briefing was: "For the next trials you will play the role of an owner whose greyhounds are entered in a series of races. Your dog will be pointed out at the beginning of each race, and its speed will be determined by a random number generator in the computer. Your task is to try to use PK to influence the RNG so that your pre-selected dog wins the race. You'll see the race in real time so you get feedback on how well you're doing." Prior to each owner race, participants were asked to press the space bar to start the race. Virtual prize money was allocated on the basis of finishing position, with £100 being awarded for victory, £50 for second place and £25 for third place. No money was awarded for finishing in positions 4 to 6 .All participants completed both blocks with the order of completion counterbalanced across participants. Within each block, half the trials were as given in the briefing (e.g., tested for ESP in the gambler block), but half were not (e.g., tested for PK in the gambler block) to gauge the effect of expectation on performance. The experimenter (RD) remained outside the research cubicle during trials but was available should assistance be required. After the program had finished RD debriefed participants, describing the nature of the four conditions within the task and explaining the need to have a higher and lower arousal condition. Given the mild deception involved, great pains were taken to ensure that participants were satisfied of the need for the study to be designed as it was and to be sure that they were happy for their data to be included in analysis. None of the participants asked to withdraw.

Results and Discussion

The planned outcome measure here was the finishing position of participants' greyhounds in computer races, but to get a sense of whether overall performance was above MCE we shall firstly consider the overall amount won by each participant. The greater the success at the task the greater the amount of prize money won. If chance alone were operating then a participant would, on average, have won prize money of £700. We can see from Figure 1 that the distribution exhibits a positive skew so that although the median amount won is a little below this theoretical value, the mean prize money is nonsignificantly above it (M = £715.0, SD = £229.1; Wilcoxon $Z = -0.029$, $p = .977$, 2-tailed). This is an improvement on studies 1 and 2, in which the average prize money won was £648.10 and £660.6 respectively.

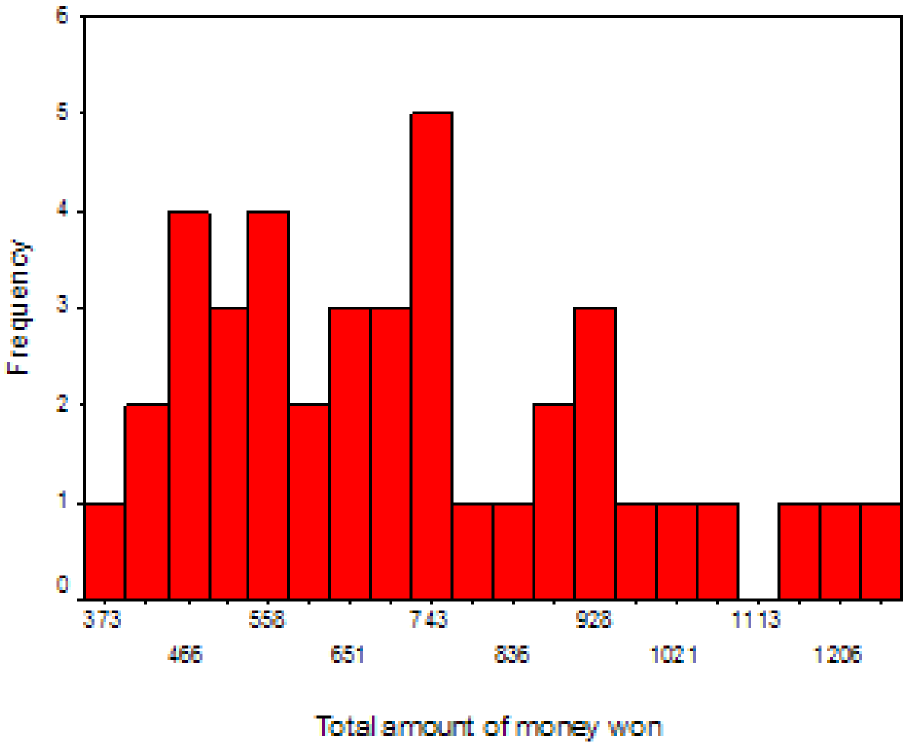

Figure 1. Frequency histogram of prize money 'won' by participants

As before, it was planned in advance to use sum of ranks for final finishing position as the principal outcome measure. The distribution of ranks for each of the four conditions is given in Table 1. We can see that in terms of overall scoring, results in this study were again rather disappointing, with the total sum of ranks greater than the MCE of 3360.

Performance was worse than chance in three of the four conditions, the exception being disguised PK, but these deviations were not significant. There was no overall difference in performance across the conditions (Friedman's $\mathcal{X}^2 = 2.76$, $p = .50$).

Table 1: Sum of ranks for greyhound finishing position

Condition	Finishing position						SOR	Z score	Effect size (r)
	1	2	3	4	5	6			
MCE	40	40	40	40	40	40	840		
True PK	38	40	31	38	52	41	869	1.078	.070
Disguised PK	49	45	37	21	47	41	815	-.926	-.060
True ESP	41	31	31	47	46	44	878	1.418	.092
Disguised ESP	44	42	35	36	36	47	861	.775	.050
Total	172	158	134	142	181	173	3401	.765	.025

To consider whether similar patterns of performance across individuals are evident for ESP and PK conditions (either informed or disguised), we considered covariation of performance across the four conditions. Correlations of individual sum of ranks scores are given in Table 2. We can see from this that the largest effect is a suggestive correlation between true and disguised PK. This might suggest that earlier concerns about the test-retest reliability for psi were overstated and that participants can exhibit a degree of consistency in performance. However, in both previous studies a modest negative correlation was found between these two variables, and the association between true and disguised ESP performance here is well within what might be expected by chance alone. In both previous studies the largest positive correlation was that between true ESP and true PK. We can see that this was not replicated here, though there is a medium-sized (but nonsignificant) correlation between disguised ESP and disguised PK.

Table 2: Spearman rho correlation coefficients (with p values in parentheses) for comparisons of individual performances in the four conditions (N = 40)

	True ESP trials	Disguised ESP trials	True PK trials
Disguised PK trials	-.020	. 231	.267
	(.904)	(.151)	(.095)
True ESP trials		-.096	.056
		(.555)	(.730)
Disguised ESP trials			.186
			(.250)

Covariation of performance with condition and arousal level

Based on our review of the literature, we speculated that one possible point of departure in the preferred conditions for ESP and PK functioning was in the physiological arousal of participants. Table 3 gives the mean sums of ranks for participants in the relaxed and aroused conditions for each of the four psi tasks. As predicted, participants in the relaxed condition fared slightly better than those in the aroused condition for the true ESP task. However, relaxed participants also performed slightly better than aroused participants in both of the PK tasks, and were slightly worse for the disguised ESP task. These findings therefore fail to confirm earlier suggestions that muscle tension gives rise to superior PK performance compared with relaxation (Braud, 1981, 1985; Honorton & Barksdale, 1972), nor that the reverse pattern holds for ESP performance (Honorton, 1977)[3].

Table 3: Mean sums of ranks (and SDs) for participants in the relaxed and aroused conditions for the four psi tasks

	True ESP	Disguised ESP	True PK	Disguised PK	Overall
Relaxed	20.90	21.30	21.20	20.20	83.60
(N = 20)	(5.04)	(5.61)	(5.28)	(4.41)	(13.28)
Aroused	23.00	20.65	22.25	20.55	86.45
(N = 20)	(4.22)	(5.35)	(3.74)	(3.78)	(8.36)
Wilcoxon Z	-1.398	-.447	-.570	-.217	-.488
p (2-tail)	.162	.655	.568	.828	.626

Table 4 gives the correlation coefficients for the relationship between individual differences measures and performance in the four conditions. It is important to note that the outcome measure here is sum of ranks so that greater scores indicate ‘worse’ performance at the task. Thus positive correlations with belief indicate that higher scores on the belief and attitude measures are associated with worse performance at the task whereas negative correlations indicate better performance at the task as belief scores increase. Few of the measures seem promising as predictors of performance. The only statistically significant correlation occurred between geomagnetic activity and true PK performance, with better performance being associated with greater activity as suggested previously (e.g., Braud & Dennis, 1989). However a similar (albeit nonsignificant) pattern is evident for True and Disguised ESP, which

[3]Participants allocated to the relaxed and aroused conditions did not differ significantly in terms of state or trait anxiety, extraversion, belief or prior experience, ($p > .3$ in all cases).

contrasts with the typical finding that quiescence is ESP conducive (e.g., Persinger, 1989). There are suggestive correlations between true ESP performance and both belief in survival and prior laboratory psi testing experience. However, both of these relationships were positive, suggesting that greater belief and experience were associated here with worse performance. Also, unexpectedly, greater state anxiety was associated here with better performance on the Disguised ESP task. Given that 44 analyses are presented in Table 4, we might expect to find four correlations with $p < .1$ by chance alone and so we should be wary of over-interpreting these putative relationships.

Table 4: Spearman correlations between task performance and belief and personality variables (probabilities in parentheses are two-tailed)

	True ESP	Disguised ESP	True PK	Disguised PK
PK single-item belief measure	.217	.088	.026	.005
	(.180)	(.588)	(.872)	(.977)
ESP single-item belief measure	.155	.051	.081	.014
	(.339)	(.757)	(.619)	(.930)
Overall ASGS score	.228	.098	.115	-.009
	(.158)	(.548)	(.478)	(.957)
ESP factor	.217	-.032	.129	-.047
	(.179)	(.847)	(.426)	(.775)
PK factor	.216	.194	.197	.008
	(.181)	(.230)	(.223)	(.961)
Survival factor	.294	.163	-.083	.150
	(.066)	(.315)	(.610)	(.354)
Prior experience	.307	.119	-.161	-.143
	(.054)	(.466)	(.320)	(.379)
Religiosity	.053	-.141	.190	-.025
	(.744)	(.386)	(.240)	(.881)
State anxiety on STAI	-.086	-.284	.078	.219
	(.597)	(.075)	(.632)	(.174)
Trait anxiety on STAI	.125	-.115	-.004	.082
	(.441)	(.479)	(.978)	(.614)
3-hour K index value	-.173	-.176	-.312	-.205
	(.286)	(.286)	(.050)	(.205)

Finally we attempted to replicate the tendency for those who present as Feeling/Perceiving on MBTI measures to outperform those who present as Thinking or Judging types (see, e.g., Honorton et al., 1990; Schmidt & Schlitz, 1989). The mean sums of ranks for Feeling-Perceiving and non-FP types are given in Table 5. Again, note that higher sums of ranks indicate worse performance at the task. We can see that there is a consistent, though nonsignificant, tendency for non-FPs to perform better at the psi task, contrary to expectation. The cumulative effect gives rise to a suggestive difference. If replicated this would constitute an interesting reversal.

Table 5: Mean sums of ranks (and standard deviations) for FP and non-FP types for the four conditions

	True ESP	Disguised ESP	True PK	Disguised PK	Overall
Feeling-Perceiving	23.19	22.50	22.38	21.19	89.25
(N = 16)	(3.56)	(3.93)	(5.18)	(3.90)	(9.13)
Other	21.13	19.96	21.29	19.83	82.21
(N = 24)	(5.24)	(6.09)	(4.13)	(4.15)	(11.48)
Wilcoxon Z	-.998	-.983	-.790	-.983	-1.894
p (2-tail)	.318	.326	.430	.325	.058

General Discussion

It is clear that we still need to address the disappointing overall performance of participants, which over the series of three studies to date has not deviated significantly from chance despite our best efforts to generate an engaging and attractive task. In the course of the series of studies we have tried to be systematic in identifying possible confounding factors. As a result we are confident that performance isn't inhibited by the inclusion of an element of deception (Roe et al., in press). Nor can we now attribute it to the method by which decoy greyhounds' movements are controlled. Whereas in Study 2 the correlation between participants' sums of ranks for PK trials and overall sampled RNG output was -.624, with the improvements made here it rose to -.810 ($p < .001$) so that shared variance between actual RNG output and performance at the PK task as measured by combined sum of ranks scores for Disguised and True PK trials increases to 65.6%.

We concede that working with unselected volunteer participants may not be ideal, but repeat our earlier comment that given the poor performance of the battery of predictors included here, which include belief and experience, as well as personality and mood measures, it is difficult to imagine on what basis one might confidently screen for participants.

One final factor that we have not yet considered but which will be the focus of a fourth study is the possible role of experimenter effects. Gardner Murphy (1949) suggested that there is no such thing as a gifted participant as such, but rather how well a participant scores on a psi task depends on the person who does the testing and the nature of the experimental conditions. To date, all experimental trials and all interactions with participants have been by the second author (RD). Although involved in the later stages of design of these studies, RD was not involved at the project's inception and may not feel the same degree of 'ownership' of the project that the first author (CR) would feel through having been responsible for the seed idea, conducting background literature research, writing funding proposals, and so on. Secondly, although RD has a Bachelor's degree in Psychology and has previously conducted a parapsychological study for his dissertation, he would nevertheless be considered to be a novice experimenter. It could be that if a more experienced psi researcher had interacted with participants then a different outcome might have occurred. In the final study in this series it is planned to have half the trials conducted by RD and half by CR. It will be interesting to see whether there are any differences in participant performance between these two samples.

Reflecting on the failure to find a differential effect for the relationship between participant arousal and ESP and PK performance, we should note that of course, we have no guarantee here that participants adhered to the instructions they were given. Nor can we be sure that participants' own natural state of arousal did not overwhelm or interact with the effects of our instructions to them (if they were nervous or energised, perhaps no amount of soothing music would make them truly relaxed). However, we should also note that when we consider participant scores on measures of state and trait anxiety, these too do not conform to expectation, with the two strongest effects suggesting that greater state anxiety was associated with better disguised ESP performance and worse disguised PK performance. Nevertheless, it would have been useful to be able to monitor the efficacy of the manipulation by, for example, taking some kind of physiological measure of arousal, and where resources allow we would strongly recommend this in future replications.

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Exploratory Analyses of Refined Predictors of Subjective ESP Experiences and Temporal Lobe Dysfunction in a Neuropsychiatric Population

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Abstract

Following up on previous research indicating a relationship between symptoms of temporal lobe dysfunction (TLD) and subjective paranormal experiences, exploratory logistic regression analyses were conducted to discover specific predictors of subjective ESP experiences (S-ESP) among 100 neuropsychiatric patients of Neppe. Predictors included gender, age, 16 items from a questionnaire measuring symptoms of TLD (INSET), clinical and ambulatory EEG measures reflecting the location and type of anomalous EEG activity, measures of handedness and brain laterality, use of specific recreational drugs, and brain injuries. The final model defined the S-ESP group as right-lateralized females scoring high on INSET items reflecting jamais vu and primitive visual or auditory hallucinations. A significant interaction was found between gender and EEG anomalies occurring in the temporal lobes and sometimes extending to adjacent areas, but not generalized over the whole scalp. These anomalies were positively related to S-ESP in females and negatively in males. The effect for females was contributed entirely by activity other than slowing (mostly spiking, sharp waves, and bursts of beta or alpha) that occurred in the left hemisphere, sometimes extending bilaterally to the right temporal, or the frontal lobes. These exploratory findings need to be cross-validated before the results can be considered conclusive.

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Introduction

Research by Neppe (1983b) and Persinger (1984; Persinger & Vaillant, 1985) has provided evidence for an association between subjective paranormal experiences (SPEs) and the temporal lobes of the brain. This evidence is based on correlations between scores on questionnaires asking subjects about personal experiences such as ESP, out-of-body experiences (OBEs), mystical experiences and apparitions, and positive responses to questions about symptoms characteristic of temporal lobe dysfunction (TLD). However, this research has been restricted to 'normal subjects' whose symptomatology was not of such a degree as to classify them as having temporal lobe disease. Additional background on this research can be found in Palmer and Neppe (2003).

The purpose of the present project, the primary results of which were reported previously (Palmer & Neppe, 2003), was to see if these results could be replicated with a clinical sample. The computerized files of 100 of Neppe's neuropsychiatric patients were blind rated for TLD and SPEs by two independent raters. TLD diagnosis was based on four criteria: (1) responses to 16 items from Neppe's short INSET questionnaire that reflect various symptoms characteristic of TLD that can afflict a patient at any time; (2) etiological predisposing factors including (a) brain insults such as concussions, tumors, and encephalitis and (b) use of certain recreational drugs, (3) results of waking, sleeping, and ambulatory EEGs, and (4) response to prescribed anti-convulsant (A-C) medications. SPE scores were based on 4 item scores from the INSET addressing frequency of S-ESP experiences, OBEs, and 'sense of presence' (apparitions). In support of the hypothesis, the TLD group had a significantly higher mean on the SPE scale than the control group, $p < .05$, one-tailed. However, when gender was introduced as a covariate in an analysis of variance, the TLD hypothesis was no longer supported. A multiple regression analysis predicting SPEs from the four individual TLD criteria plus gender and using all 100 patients indicated significant, independent contributions to the prediction of SPEs by only INSET ($p < .001$) and gender ($p = .004$). This result means that the confirmation of the TLD hypothesis is due entirely to the contribution of the INSET component, confirming a relationship found by Neppe (1983b) with a non-clinical sample. The 4 TLD components did not correlate significantly among themselves, suggesting they were not measuring the same thing. This means that they must be treated separately in subsequent analyses.

For the present follow-up report, exploratory logistic regression analyses were computed to determine a set of more refined predictors, derived from the global predictors that were previously discussed, which would distinguish those patients who had frequent subjective ESP (S-ESP) experiences from those who had none. The intent of this exercise was to discover and describe the strongest effects in this particular data set, and the *p*-values should be interpreted in this light. We fully recognize that these data need to be cross-validated with an independent sample to be considered conclusive in an inferential sense.

S-ESP experiences were chosen as the criterion variable rather than SPEs in general because only ESP qualifies as a paranormal process. Apparitions and out-of-body experiences are only considered paranormal insofar as they include an ESP or psi component, in which case they would most likely also count as S-ESP experiences. It should be noted, however, that the various SPE categories were highly intercorrelated.

Method and Results

The original sample consisted of 100 of Neppe's (VN's) neuropsychiatric patients most frequently referred to him because of symptoms indicative of TLD. The list was assembled essentially by starting with his most recent cases and working backwards until the quota of 100 was reached. A more detailed explanation of the selection procedure is presented in Palmer and Neppe (2003). There were 68 females and 32 males.[1]

S-ESP experiences were originally coded on a 4-point scale, with 3 = frequent, 2 = occasional, 1 = rare, and 0 = never. By dropping the '1' category, we were able to obtain two groups of approximately equal size that unambiguously reflected the two poles of the construct of interest. The 'S-ESP' group (2 + 3) had N = 53 (46 female, 7 male) and the 'No S-ESP' group (0) had N = 40 (24 female, 16 male). Thus, 93 of the original 100 patients were included in the logistic regression analyses. These patients ranged in age from 18 to 69, with a mean of 42.6. As was the case with the original SPE variable, females were more likely to have

[1]We have no ready explanation for the large predominance of females in the sample. We are aware of no studies indicating a prevalence of TLD among females, but neither are we aware of any studies that refute such a trend. Another possibility is that females are more likely than males to seek treatment for TLD, although this seems unlikely given the debilitating nature of the symptoms experienced by persons with TLD.

frequent S-ESP experiences than males, 69.9% vs. 30.1%, $\mathcal{X}^2$ (1, N = 93) = 16.73, $p < .001$.

Preliminary Regression Analyses

Logistic regression analyses were carried out to determine sets of predictors that could optimally predict S-ESP to a significant degree. Logistic regression is similar to multiple regression, except that it applies when the dependent variable is categorical, as it is in this case. Analyses involving two or fewer predictors used the 'logit model' in SYSTAT 6.0 (Wilkinson, Blank, & Gruber, 1996), but more complex analyses were performed using a maximum likelihood estimation procedure from SAS 8.0. The SAS software gave virtually identical results to the SYSTAT software in test comparisons that both programs could handle. SYSTAT results are reported as z's and SAS results as chi-squares. Discriminant analysis is not appropriate for these data because many of the predictors are not multivariate normal (Press & Wilson, 1987). Also, discriminant analysis does not handle control variables, such as gender in the present case.

We decided to treat separately at the outset each of 3 broad categories of predictors used for the global analyses – INSET, etiological factors, and EEG – plus two new ones, brain hemisphere dominance and age, attempting to find a set of significant predictors. These predictors were subsequently combined to yield the final model. Response to anticonvulsant drugs was not included because this variable could not be effectively broken down into more discrete categories and did not predict SPEs in the global analyses (Palmer & Neppe, 2003).

Because of the potential confounding effect of gender, this variable was included in all the analyses testing the effects of the predictors mentioned above on SPEs. If the interaction term was not significant, the analysis was repeated with the interaction term removed. These later analyses were used to determine if the predictor was significant, controlling for gender. As recommended by Hosmer and Lemeshow (2000), a *p*-value of .10 (two-tailed) was used as the criterion for inclusion in the models.

INSET (N = 16 predictors): Regression analyses were performed on each of the 16 INSET items (listed in the Appendix), coded on a 0 – 3 scale. The 5 items that were statistically significant controlling for gender are listed at the top of Table 1. These variables, along with gender, were entered into a series of more complex regression analyses, with the least significant variable being removed each time until the remaining predictors in the model were significant. During this process it was decided to combine 2 of the variables (visual hallucinations and auditory hallucinations) into a single variable, as they had comparable *p*-values (.191 and .161), were conceptually related, and were moderately correlated with each other, $r_{(97)} = .348$. The final model contained 3 significant predictors: Gender, $\mathcal{X}^2$ (1, N = 92) = 11.33, $p = .0008$; visual/auditory hallucinations, $\mathcal{X}^2$ (1, N = 91) = 6.52, $p = .011$, and jamais vu experiences, $\mathcal{X}^2$ (1, N = 91) = 4.48, $p = .034$. Both INSET effects were positive, meaning that a high score on the item characterized the S-ESP group.

Table 1: Significant ($p < .10$) predictors of S-ESP experiences, controlling for gender

	Item	Description	p^a
INSET:			
	48	Nightmares	.003
	15	Auditory Hallucinations	.025
	13	Visual Hallucinations	.031
	19	Jamais Vu	.037
	7	Memory Disturbances	.091
EEG:			
	LC	Left-Central	.071
		Hemisphere Dominance:	
		Laterality	.008
		Handedness	.011

[a] Uncorrected for multiple analysis

Etiology (N = 6): For the regression analyses on etiological factors, separate codes were created for the 4 recreational drug classes that had more than 5 patients using them to a significant extent: marijuana, hallucinogens (LSD, psilocybin, mescaline), amphetamines, and cocaine. Significant use of any of the above was coded as a separate variable labeled ‘drugs’. Because the overwhelming majority of brain insults were concussions, these insults were combined in a single category labeled ‘head’. None of these variables significantly predicted S-ESP experiences with gender controlled.

EEG (N = 25): The patient files included details about the presence and nature of specific EEG abnormalities or anomalies, and their locations as indicated by the surface electrodes. These details were not available for 1 patient, a male. Locations could be specified by hemisphere (right, left, bilateral, or general) and lobe [temporal, frontal, central, parietal, or occipital][2]. Two specific types of activity were also earmarked: spiking and slowing (unusual delta or theta-wave activity). The remaining activity consisted of such wave patterns as bursts of fast beta or alpha. Because of the nature of Neppe's patient population, anomalies were more frequent in the temporal lobes than in other areas, and more patients had left temporal anomalies than right temporal ones (45 vs 18). Many possible variables could not be included in the analyses because their frequencies were less than 5. The remaining 25 variables are listed in Table 2.

Of the 25 EEG variables tested, only LC (left central) was significant, $z = -1.81$, $p = .070$. LC is associated with an absence of S-ESP experiences.

Brain Hemisphere Dominance (N =2): Because of its possible relevance to the EEG, we decided to include brain hemisphere dominance as a category for the regression analyses. The patients' files had 2 indirect measures of this variable: 'handedness' and 'laterality'. For handedness, patients were simply asked on the INSET screen if they were left or right-handed. To measure laterality, patients were asked the following three questions: (1) 'Which hand do you write with?' (2) 'Which side do you bat or throw with?' and (3) 'Which side do you kick with?' These questions were intended to establish at a basic level whether or not the patients exhibited mixed functions for controlling basic dominant characteristics, reflecting possible higher brain functions that may be purely on one side or cross into both hemispheres. Laterality and handedness were amplified during the neurological examination by observing which hand was used in certain tests (writing, cerebellar diadokokinesia – a finger nose test) as well as by asking clinically relevant questions.

Both handedness and laterality were recorded as 'left', 'right' and 'both' (also called 'either'). The 'both' option was assigned for laterality when the patient gave inconsistent responses to questions or indicated

[2]These 'lobe' designations represent electrode placements in the 10-20 system.

Table 2: Analyzed EEG codes (N in parentheses)

		Right	Left	Bilateral	Total
Temporal	Spike	RTX(7)	LTX(19)	BTX(6)	TX(27)
	Slow	-	-	-	TS(17)
	All	RT(18)	LT(45)	BT(18)	TEM(54)
Frontal	Spike	-	-	-	-
	Slow	-	-	-	FS(8)
	All	RF(9)	LF(10)	BF(6)	FRO(21)
Central	Spike	-	-	-	-
	Slow	-	-	-	-
	All	-	LC(8)	BC(5)	CEN(12)
Parietal	Spike	-	-	-	-
	Slow	-	-	-	-
	All	-	-	-	-
Occipital	Spike	-	-	-	-
	Slow	-	-	-	-
	All	-	-	-	-
General	Spike	-	-	-	X(33)
	Slow	-	-	-	SLO(31)
	All	RG(7)	LG(5)	BG(14)	GEN(21)
Total	Spike	-	-	-	-
	Slow	-	-	-	-
	All	RGT(25)	LFT(45)	-	-

that they used either hand for some or all of the tasks.

Because over 75% of the patients in the regression sample were right handed, and the same percentage right lateral, it was decided for purposes of the regression analyses to combine the 'left' and 'both' categories. (This is not meant to imply that the two groups are equivalent.) Handedness and laterality were highly correlated in the total sample, $r_{(97)} = .859$ and the regression sample, $r_{(91)} = .866$.

Both variables significantly predicted S-ESP experiences controlling for gender: handedness, $z = 2.58$, $p = .010$; laterality, $z = 2.78$, $p = .005$. Because of the high correlation between the two predictors, we decided to select only laterality for the final model. The direction of the effect indicated that right-laterality (left-hemisphere dominance) was associated with the presence of S-ESP experiences.

Age (N=1): Age had no relation to S-ESP.

The Final Model

Based on the initial stage of variable selection, 4 predictors (visual/auditory hallucinations, jamais vu, left-central EEG, and laterality) were selected, in addition to the control variable, gender. LC dropped out of the final model, which is presented in Table 3. The variables are listed in order of their odds ratios, which in the context of their confidence intervals represent the relative strengths of the relationships. Note that gender is by far the strongest predictor. 83.5% of the possible predictions from the model were concordant[3] and only 13.2% discordant.

Table 3: Maximum likelihood estimates from final logistic regression model

Variable	DF	Parameter Estimate	Standard Error	Wald $\mathcal{X}^2$	Prob. of $\mathcal{X}^2$	Odds Ratio[a]	
Gender	1	2.12	0.60	12.52	.0004	8.32	(2.57/26.93)
Laterality	1	1.70	0.69	6.13	.013	5.49	(1.43/21.15)
Jamais Vu	1	0.78	0.35	5.07	.024	2.19	(1.11/4.33)
V/A Hallu.	1	0.33	0.13	6.49	.011	1.39	(1.08/1.79)

[a]Confidence limits (95%) of odds ratios in parentheses

Interactions with Gender

Temporal EEG: The only predictor variable to significantly interact with gender is an EEG variable labeled TEM, $\mathcal{X}^2$ (1, N = 91) = 6.50, $p = .011$. Patients were coded positive on this variable if their EEGs indicated abnormal activity of any kind in either the right temporal, left temporal, or both. Patients with generalized abnormal activity were not coded positively for TEM, although the generalized activity may have included the temporal lobes. A further examination of this interaction revealed that for females, temporal-lobe abnormalities were significantly associated with the presence of S-ESP experiences, Yates-corrected $\mathcal{X}^2$ (1, N = 65) = 3.88, $p = .049$, $\phi = .279$[4], whereas for males temporal lobe abnormalities were associated marginally with an absence of S-ESP experiences, $p = .091$ by Fisher's exact test, $\phi = -.359$. These relationships are illustrated in Table 4.

[3]This means that for all possible pairings of experimental and control subjects, the model properly classified the two patients 83.5% of the time.

[4]ϕ (*phi*) can be considered as a measure of the effect size.

Table 4: S-ESP experiences by Gender as a function of temporal lobe abnormalities

Females:					Males:				
		S-ESP					S-ESP		
		Yes	No	Total			Yes	No	Total
Temp. EEG	Yes	33	8	41	Temp. EEG	Yes	1	11	12
Abn.	No	13	11	24	Abn.	No	6	9	15
	Total	46	19	65		Total	7	20	27

The previously reported finding (Palmer & Neppe, 2003) that females had higher average code scores for temporal EEG disorder than did males is confirmed with TEM as the criterion variable, $\mathcal{X}^2$(1, N = 99) = 4.57, $p = .033$. 61.8% of females had temporal lobe anomalies, compared to 38.7% of males.

Refinements of TEM: Temporal-lobe abnormalities had been further classified in terms of type (spike, slowing, and other) and location (left hemisphere, bilateral, right hemisphere), as illustrated in Table 2 above. A set of univariate logistic regression analyses were performed to explore whether these more refined variables made a difference for females. Regarding type, the positive relationships between the abnormality and S-ESP were stronger for spikes, $z = 0.91$, and other, $z = 1.81$, than for slowing, $z = 0.15$. For spikes and other combined, the relationship was significant, $z = 2.31$, $p = .021$. Removing patients from the TEM group whose anomalies were restricted to slowing increases the relationship in Table 4 slightly, $\phi = .304$. As for location, the regressions were positive for left-temporal, $z = 1.37$, and bilateral, $z = 0.97$, but negative for right temporal, $z = -0.35$. For left temporal and bilateral combined, the relationship was significant, $z = 2.31$, $p = .021$. Restricting the TEM group to those with only left temporal and/or bitemporal anomalies slightly strengthened the Table 4 relationship for females, $\phi = .329$.

A third refinement was called for by virtue of the significant negative relationship between S-ESP and anomalous firing in the left central area. To take this apparent suppressor into account, patients who survived the preceding cuts were removed from the temporal group if the anomalies extended to the central area. This final pruning of the TEM group increased the effect for females further still, $\mathcal{X}^2$(1, N=65) = 9.80,

$p = .002$, $\phi = .422$.

The TEM female group has now been redefined as consisting of females with abnormal EEG activity other than slowing, either in the left temporal lobe (sometimes extended bilaterally to the right temporal lobe) or to the frontal lobes, only. A comparable description cannot be offered for males because there was only one male positive for TEM who was also positive for S-ESP. The only EEG abnormalities in this patient were spiking in the right temporal lobe. However, males can still be classified, using the same refinements for the purpose of providing a baseline for the females. The new analysis is labeled TEMR, for 'TEM revised', and the new cell frequencies are listed in Table 5. As compared to Table 4, the strength of the EEG-ESP relationship increased substantially for females (.279 vs .422 for ϕ) and slightly for the male comparison group (-.359 vs -.384). 92.9% of females with temporal lobe abnormalities are now correctly classified regarding S-ESP experiences, as compared to 80.5% in Table 4.

Table 5: S-ESP experiences by as a function of temporal lobe abnormalities (TEMR), separately by gender

Females:					Males:				
		S-ESP					S-ESP		
		Yes	No	Total			Yes	No	Total
Temp.	Yes	26	2	28	Temp.	Yes	0	8	8
EEG					EEG				
Abn.	No	20	17	37	Abn.	No	7	12	19
	Total	46	19	65		Total	7	20	27

A Regression Model for Females: We decided to develop a logistic regression model for females, selecting variables that were significant for the total sample, variables that interacted significantly with gender, and variables that were significant for females separately (see Table 5). This meant that the variables entering the model initially were: jamais vu, visual/auditory hallucinations, laterality, and TEMR.

All variables met the $p < .10$ criterion except jamais vu ($p = .294$). The remaining variables then defined the final model for females, which is illustrated in Table 6.

The weakness of the contribution by laterality likely results from the fact that for some reason right-lateralized patients were more likely to be in the TEMR group than left/mixed lateralized patients, corrected $\mathcal{X}^2(1, N=65) = 3.77$, $p = .052$. Correlated predictors reduce individual contributions to regression equations.

Table 6: Maximum likelihood estimates from the model, females only

Variable	DF	Parameter Estimate	Standard Error	Wald $\mathcal{X}^2$	Prob. of $\mathcal{X}^2$	Odds Ratio[a]	
TEMR	1	2.66	0.91	8.53	.004	14.22	(2.39/84.50)
Laterality	1	1.31	0.79	2.78	.095	3.73	(0.80/17.46)
V/A Hallu.	1	0.49	0.19	6.85	.009	1.63	(1.13 / 2.35)

[a]Confidence limits (95%) of odds ratios in brackets

Discussion

The regression analyses succeeded in highlighting specific variables that are significantly associated with S-ESP experiences. However, as noted in the introduction, this outcome resulted from a great deal of 'data-snooping' and some of the significant relationships are likely to be type-one errors. A related problem is that the number of patients in some of the cells is quite low, due to a combination of low Ns overall and extreme splits on some variables. One consequence of this problem is wide confidence intervals for the odds ratios of some regression variables. None of the results from the regression analyses can be considered conclusive until they are cross-validated in an independent sample including a larger number of males. Finally, we recognize that SPEs are multi-determined and the variables addressed in this study almost certainly do not comprise the totality of the factors that are associated with their manifestation.

Gender

Gender was clearly the strongest predictor of S-ESP. This finding should not be surprising to parapsychologists. Schouten (1979, 1981a, 1981b) found that three major collections of spontaneous cases each included more females than males as percipients. This pattern did not show up as clearly in Palmer's (1979) Virginia survey using random sampling techniques, although females were more likely to report waking S-ESP experiences than males to a suggestive degree (p = .052). On the other hand, a survey conducted by the Gallup organization for the European Value Systems Study Group with a large sample of 18,607 persons from the United States and various European countries found a statistically significant difference in reported psychic experiences favoring females (Haraldsson & Houtkooper, 1991). The 10% difference between males and females found by these authors is actually similar to that found in Palmer's (1979) total sample, but the latter did not reach significance because of the much smaller sample size. Back to the other hand, a large random sample collected by Blackmore (1984) yielded no significant difference between males and females in the reporting of telepathic experiences. Nevertheless, the weight of the evidence favors the conclusion of more reports of ESP experiences among females than among males.

It is possible that the gender differences regarding S-ESP experiences found in previous research could be reporting artifacts. In other words, women might simply be more prone to report S-ESP experiences than men. Schouten discounted this reporting artifact in his collections from Britain (Schouten, 1979) and Germany (Schouten, 1981a), because he found that females were not more likely than males to report cases in which they were not involved as percipient or target person. On the other hand, females did predominate among these outside reporters in the American collection (obtained by Louisa Rhine), so the reporting artifact was considered to be a viable interpretation for this sample (Schouten, 1981b). This explanation is less likely to apply to the positive random-sample studies (Haraldsson & Houtkoopper,1991; Palmer, 1979) because the solicitations were targeted to specific individuals randomly selected from a target population. Rhine's cases, on the other hand, came from responses to published appeals and from persons who had heard of the Duke University Parapsychology Laboratory and wanted to share their experiences. As more initiative was required from Rhine's respondents than those who had been selected randomly, the Rhine collection is more likely than the random surveys to have been influenced by reporting artifacts.

The present study, while using a non-random sample, is nonetheless more similar methodologically to the random surveys than to Rhines collection, as VN solicited his accounts of S-ESP experiences individually from his 'captive audience' of patients. On the other hand, it is still possible that VNs male patients were reluctant to mention S-ESP experiences to VN face-to-face, or they may have suppressed their S-ESP experiences per se more than females, even when they have the same temporal lobe condition. At any rate, the reporting artifact interpretation needs to be taken seriously in the present study, although it certainly cannot be considered confirmed. Finally, it should be noted that reporting artifacts cannot account for the gender differences in EEG variables found in the present study, which in turn were shown to relate to S-ESP.

INSET

Total INSET scores were found to be a strong predictor of SPEs in the main analysis. In the regression analyses, two items (or item clusters) were found to independently predict S-ESP in the positive direction: visual and auditory hallucinations, and jamais vu.

Only certain kinds of visual and auditory hallucinations are considered by VN to possibly be associated with TLD. For visual, these are movements and distortions in shape or size; for auditory, they are buzzing, ringing, and hissing sounds. The auditory and visual hallucination items were combined to form a single item, which admittedly gave them a built-in advantage in entering the final regression model. However, the combination made conceptual sense and the items in isolation were among the four strongest independent predictors of S-ESP, controlling for gender. Visual/auditory hallucinations also makes sense as a predictor of S-ESP for the simple reason that most S-ESP experiences are themselves visual or auditory hallucinations, albeit ostensibly veridical ones.

Although the hallucinations coded for TLD are much more primitive than the content of most S-ESP experiences, the relationship between visual/auditory hallucinations and S-ESP suggests that there are important commonalities in how the two types of experiences are processed in the brain. This relationship also reminds us that ESP per se and the hallucinatory experiences that often carry it are intertwined and cannot be easily teased apart. Thus, when we find correlates of S-ESP we might be finding correlates of hallucinatory activity rather than the ESP process. Resolving the ambiguity will require comparing the correlates of S-ESP experiences with those of other hallucinatory experiences that we can safely assume lack an ESP component.

The item reflecting jamais vu on INSET had the following wording: 'How often have you been in a familiar place and had the impression that you have never been in that place before? (the opposite of déjà vu called jamais vu - not recognized at all, totally unfamiliar).' Although VN has found that patients at times interpret jamais vu incorrectly, including the misclassification of derealization experiences and odd déjà vu experiences as jamais vu experiences, the patients in this research were routinely screened about their positive INSET responses, including jamais vu, so that this error would have been picked up. Nevertheless, the descriptions obtained clinically were occasionally questionable in nature and difficult to compartmentalize into a jamais vu category. VN, who developed the INSET, considers jamais vu to be the best single INSET item for the purpose of screening TLD. This conclusion was borne out by his extensive research on déjà vu, in which the wording of the jamais vu item was identical to that used in the current study (Neppe, 1983a). However, very little research has been conducted on jamais vu per se, and more needs to be done. Finally, certain kinds of déjà vu experiences, as well as certain types of olfactory hallucinations, have in the past been found by Neppe (1983a, c, d) to be closely associated with SPEs but were not studied in this research for reasons outlined in the previous report (Palmer & Neppe, 2003).

The strongest INSET predictor, controlling for gender, was actually the nightmare item. It did not enter the model because of its relatively high correlations with the other INSET items in the mix, particularly jamais vu, $r_{(97)} = .440$. It was not combined with jamais vu to form a single item, as was done with visual and auditory hallucinations, because nightmares and jamais vu do not bear an obvious conceptual relationship to each other. Nightmares are nonetheless an intriguing variable in this context because of evidence that microseizures in the temporal lobes are particularly likely during sleep (Baldy-Moulinier, 1982; Persinger & Schaut, 1988; Stevens, 1982).

Laterality

The most surprising correlate of S-ESP experiences to the authors was laterality, which was intended as a measure of hemispheric dominance. However, our operationalization of laterality was incomplete as it did not measure such attributes as right or left eye dominance, right or left ear lateralization, or right or left foot used to pick up a thumb tack. Additionally, it did not take into account the major marker of hemispheric dominance, namely speech. Speech dominance is not easily measured except by techniques such as the Wada test (Wada & Rasmussen, 1960) of injecting sodium amytal into the carotid arteries, but even this test has its limitations in interpretation. Laterality measures without speech do not assure completely accurate assessment of which hemisphere is dominant. Nonetheless, pure right laterality as we defined it for the present study almost certainly implies left hemisphere dominance (99% or above), and mixed laterality and left laterality imply likely right hemisphere dominance (80% or above). Still, these are clinical estimates.

There has been some exploration of brain hemisphere laterality in the experimental ESP literature, but the results have been inconsistent. Broughton (1978) reported results from three studies that collectively suggested subjects scored best on a forced-choice type ESP task when they performed the test with the left hand (right hemisphere dominance) simultaneously with a left-hemisphere distraction task. The effect was demonstrated only for males. On the other hand, Maher and Schmeidler (1977) found significant scoring, also restricted to males, only when the forced-choice ESP task was taken with the right hand while the left hand was occupied with a pattern-tracing task designed to activate the right hemisphere. However, this finding could not be replicated (Maher, Peratsakis, & Schmeidler, 1979). Finally, Alexander and Broughton (2001) found that left-dominant subjects, as measured by the Cognitive Laterality Battery (Gordon, 1986), scored somewhat better in a free-response ESP ganzfeld experiment than did right dominant subjects, but the performance of the left-dominant subjects only approached significance ($z = 1.60$). No reports of gender effects were included.

Temporal EEG

The rationale that underlies our research received support from the EEG analyses in the sense that the one area of the brain that seemed to be associated with S-ESP was the temporal lobes (TEM). This singularity may be partly due to the fact that there were much fewer cases of anomalies in other parts of the brain than in the temporal lobes, and there were too few examples of parietal and occipital abnormalities to even analyze.

The effect of EEG abnormalities in the temporal lobes was also found to depend on gender. For females, the relationship was positive, as we predicted at the outset. However, for males it was negative, albeit at a marginal level of significance ($p = .091$). We have no explanation for this reversal for males. The reversal might have been less pronounced, and perhaps nonsignificant, were we able to include data from one male patient with strong S-ESP experiences. Although enough information was available on this patient to classify him for the original analyses as having EEG abnormalities indicative of TLD, the available EEG report (from another clinic) was not precise enough to allow the more refined coding needed for the logistic regression analyses. Thus, this patient was coded as missing for EEG variables in these latter analyses.

If the overall sex difference in reported S-ESP experiences is due to under-reporting of these experiences by males, then the failure of the TEM hypothesis to hold for males can be brought into question. However, if the critical factor is indeed response bias, one would expect no relationship between TEM and S-ESP, not a reversal (unless one entertains the unparsimonious assumption that the response bias is particularly uncharacteristic of males with anomalous temporal EEG activity). However, it should again be emphasized that the reversal is weak statistically and the relevant male sample size small.

Gender differences in the relationship between TLD and ESP have also been reported in a study using normal participants, although they are not the same as those reported here. Persinger and Richards (1991) found a positive relationship between belief in the paranormal (which is strongly associated with paranormal experiences) and their CPES scale for both genders. However, for females the CPES manifested more as 'ego-alien intrusions', whereas for males they manifested more as 'sensory enhancement'.

We attempted to further refine the nature of the temporal lobe abnormalities predictive of S-ESP in our study by specifying the type of abnormality and its localization by hemisphere, creating a new variable, TEMR. The examination of which temporal lobe (right or left) was most closely associated with S-ESP seems particularly reasonable in light of the interaction between gender and left-side vs. right-side anomalies over the entire scalp. Females showed a greater left focus than males in this analysis. The emergence of laterality as a key variable also might cause one to expect laterality of the EEG anomalies as well. The effect seems to be that for females the anomalies are most likely to affect S-ESP if they are focused in the dominant (left) hemisphere (or bilaterally, which, of course, includes the left hemisphere).

Rationales notwithstanding, the results of the refinements of TEM have less statistical foundation than those discussed previously, as they appeal partly to non-significant trends in the data that were based on only a few data points. Removal of cases where the abnormality consisted of EEG slowing left a slightly stronger relationship between temporal-lobe abnormalities and S-ESP for females, but the improvement was not significant. Likewise, right-temporal anomalies contributed nothing to the temporal lobe/S-ESP relationship for females, but neither could these right-temporal anomalies be differentiated from the left-hemisphere contributions to a statistically significant degree. This state of affairs is attributable partly to the low number of cases of slowing and right-temporal loci compared to higher frequency anomalies (spikes, paroxysms, sharp waves, etc.) and left-temporal loci. The best that can be said is that effects were only demonstrated for higher EEG-frequency abnormalities that occur in the left temporal lobe.

We also excluded from the TEMR group cases in which the anomalies extended to the central area, because of the significant negative relationship between left central EEG anomalies (controlling for gender) and S-ESP. This simplified the model further by effectively restricting extension of the temporal lobe abnormalities to the frontal lobes. Moreover, the left-central finding could conceivably indicate that anomalies outside the temporal lobes might be S-ESP-inhibitory. Generalized anomalies observed over the whole scalp, controlling for gender, also related negatively to S-ESP experiences, although not significantly so, $z = -1.56, p = .119$.

Indirect empirical support for the TEMR model as defined above comes from an experiment by Alexander (2000), who found that a reputedly psychically gifted right-handed female showed excess fast EEG activity in the left temporal and frontal lobes when engaged in four marginally successful ($p = .056$) remote viewing trials as compared to matched control periods. The participant also scored high on the Complex Partial Epileptic Signs (CPES) scale (Persinger & Makarec, 1993).[5]

An examination of Table 5 reveals that prediction of S-ESP was better for females who had temporal lobe EEG anomalies than for those who did not. The poor discrimination for the latter group could be explained by noting that even with the important advantage of ambulatory EEG we only had EEG data from patients for relatively brief periods of time. It is possible that if more EEG data could have been collected, some members of the non-TEMR group who had S-ESP experiences might have revealed EEG anomalies that would have placed them in the TEMR group. Additionally, as far as VN is aware, and cer-

[5]Although Palmer had heard Alexander's paper reported at a conference over a year ago, he had not remembered the specific results at the time he was conducting the regression analyses. His memory was refreshed by Alexander when he shared our results with her after the analyses had been completed.

tainly based on the written reports of patients' experiences during ambulatory EEG, no patient in this sample had any kind of SPE during the EEG measurement periods. Consequently, these EEG measures are trait, not state variables. In VN's original research linking temporal lobe symptomatology with SPEs, he reported that there was both a state and a trait correlation of SPEs with temporal lobe symptomatology in an ostensibly normally functioning population (Neppe, 1983b).

The Temporal Lobes and Psychopathology

Finally, we would like to stress a more general point. The finding that persons with TLD symptoms have more S-ESP experiences than those with the other neurological disorders represented in our sample in no way implies that S-ESP experiences are the product of a diseased brain. Clearly, many people who have S-ESP experiences are in good neurological health, as was borne out by Neppe's original sample of members of the South African Society for Psychical Research (Neppe, 1979; 1983b). What we sought to find out in this study was what parts of the brain might be involved in SPEs. Our guess is that activity in the temporal lobes may indeed be relevant to SPEs, but this activity need not reach the extremes evidenced by some of the patients in our sample. Persinger (1983), for example, has suggested that mystical experiences, including S-ESP, might be associated with micro-seizures in the deep structures of the temporal lobes. In most cases, these micro-seizures would not be considered in any way pathological. A useful adjunct to the present study would be to explore the proportion of 'normal' participants who would be classified as S-ESP-positive using the same S-ESP questions employed in the present study, and, furthermore, to see if the INSET items reflecting TLD are as predictive of S-ESP experiences in this 'normal' population as they are in the patient population.

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Appendix

TLD Items on INSET

(1) How often do you have ( ) fits, ( ) seizures or ( ) 'peculiar spells'?

(2) How often have you had a ( ) blackout or ( ) lost consciousness for a short period for no reason?

(3) How often have you had ( ) grand mal or ( ) petit mal or ( ) myoclonic or ( ) psychomotor seizures?

(4) How often do you have or are you told that you at times lose contact with ( ) staring spells or ( ) absences or ( ) episodes where you have a blank look on your face ( ) for seconds or ( ) minutes not hours?

(6) How often have you for a very short time like seconds or minutes been completely unaware that you did or been told that you did any of the following: ( ) odd behaviors like ( ) buttoning/unbuttoning; ( ) chewing/mouth movements or ( ) other unusual movements or ( ) doing very strange things or ( ) saying strange things or ( ) finding yourself in places you don't remember going to or ( ) jerking the arms?

(7) How often do you ( ) have clear cut gaps in your memory during which you totally cannot remember anything for 5 minutes or more; ( ) miss major sections of TV shows you have been watching; ( ) find yourself driving without remembering how you got there or where you are going; ( ) do strange things automatically? Include only if you think these are not only because of difficulty you have concentrating.

(8) How often do your ( ) moods, ( ) feelings or ( ) thoughts fluctuate within minutes for no reason [like moods which are one moment ( ) very happy then very sad]?

(11) How often do you have odd sensations in part of your body like ( ) floating, ( ) turning or ( ) moving when you were doing none of those?

(12) How often have you come across a smell when there is nothing to cause it? If so, what kind (check applicable)? ( ) medicine; ( ) steak; ( ) perfume; ( ) flowers; ( ) burning; ( ) rotting; ( ) synthetic; ( ) vomit; ( ) incense; ( ) musty; ( ) grass; ( ) bitter; ( ) sweet; ( ) cake; ( ) mustard; ( ) other [*only 'burning', 'rotting' scored*]

(13) How often have you seen any of the following when there is no-one or nothing to cause it? ( ) dots; ( ) lights; ( ) patterns; ( ) shapes; ( ) wrong size; ( ) movements; ( ) distortions; ( ) things moving; ( ) stars; ( ) bugs; ( ) threads; ( ) insects; ( ) none; ( ) other [*only 'movements', 'distortions', 'wrong size' scored*]

(15) How often do you hear any of the following, when there is no-one or nothing to cause it? ( ) buzz; ( ) ring; ( ) sizz; ( ) hiss; ( ) tap; ( ) songs; ( ) whistling; ( ) music; ( ) single word; ( ) arguing; ( ) names; ( ) voices; ( ) jumble; ( ) message; ( ) instructing; ( ) radio / TV; ( ) phone; ( ) nothing; ( ) other [*only 'buzz', 'ring', 'hiss' scored*]

(19) How often have you been in a familiar place and had the impression that you have never been in that place before? (the opposite of déjà vu called jamais vu - not recognized at all, totally unfamiliar)

(23) How often have you found that, for no apparent reason, you are actually reliving things in the past (as if the past flows like a movie screen before you)?

(28) How often do you have sudden, unexplained and uncontrollable attacks of intense fear?

(34) How often do you hear what is being said, yet you cannot understand or make sense of it?

(48) How often do you have frightening nightmares?

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The First Digital Autoganzfeld Study Using a Real-Time Judging Procedure

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Abstract

A new technique for digital autoganzfeld is used, in which the receiver's mentation report is captured and automatically stored to a digital audio file to make possible a playback of the film clips (picture and film sound) and the mentation (sound) exactly synchronously. This also makes it possible to superimpose the mentation report on the three control (decoy) film clips. This feature might facilitate the evaluation of a trial and render better insights into the study of psi. Another advantage with the new digital system is that it is possible to allow two target film clips to be used rather than one, which is a more time and cost efficient way of collecting data. In order to evaluate how well the newly developed digital autoganzfeld system works, it was used in 128 trials in which 64 pairs of receivers and senders took part. It was hypothesised that the digital ganzfeld result would statistically significantly exceed the mean chance expectation (25%) as measured by direct hits, the sessions being evaluated by an external judge. The result was a direct hit rate of 23% (p=.386, binomial one-tailed test), which was close to chance expectation. In half the trials, the receivers also evaluated their sessions, which resulted in a direct hit rate of 14% (p=.050, binomial two-tailed test). Exploratory analyses yielded results that might explain the failure to give a significant psi-hitting result.

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Introduction

Since the ganzfeld technique for investigating psi[1] was developed in the 1970's (Braud, Wood & Braud, 1975; Honorton & Harper, 1974; Parker, 1975a), it has been continuously modified to meet more stringent standards. One major change occurred when Berger and Honorton (1985; Honorton et al., 1990) developed an automated ganzfeld testing system to eliminate potential methodological problems identified in earlier ganzfeld studies (Honorton, 1979; Hyman & Honorton, 1986; Kennedy, 1979). Until then, a manual ganzfeld system had been used. In a typical manual ganzfeld system everything from the randomisation of targets to the recording of ratings is done manually.

The autoganzfeld system was based on a computer controlled video cassette recorder (VCR) with a custom-built video switch that allowed the computer to control the VCR's video output to each of three TV monitors. In the autoganzfeld system there was automated target randomisation and record-keeping as well as a highly automated procedure which had to be adhered to. Although very successful in terms of psi results (Bem & Honorton, 1994), the autoganzfeld failed to become widely used; possibly because it was an expensive system, both in time and money (Child, 1986). When the Psychophysical Research Laboratories (PRL), where the autoganzfeld had been developed closed down, the equipment was donated to the Institute for Parapsychology (Broughton & Alexander, 1995). The two other facilities that had access to an automated ganzfeld system were Edinburgh University (Morris, Cunningham, McAlpine & Taylor, 1993) and Amsterdam University (Bierman, 1995).

Recently, advances in technology have led to the possibility of digitising the autoganzfeld system. A digital autoganzfeld system basically relies on a computer, autoganzfeld software, and computer monitors. A digital autoganzfeld system has recently been developed at Edinburgh University (P. Stevens, personal communication, September, 2000). One major advantage with digital autoganzfeld is that the software can be widely distributed. Thus, the Edinburgh software has also been installed and run at University College Northampton (Roe & Sherwood, 2001). Different autoganzfeld software has been developed at Liverpool Hope University College (Fox, Smith & Williams, 2002). In Göteborg,

[1]The term psi is used to denote anomalous processes of information transfer, such as ESP, that are currently unexplained in terms of known physical or biological mechanisms (Bem & Honorton, 1994).

a digital autoganzfeld system that differs from those above was developed. The main difference is that it allows a real-time recording of the mentation report to be used during the judging procedure, an idea that sprung from the earlier ganzfeld work in Göteborg.

In Göteborg, a manual ganzfeld system was used between 1995 and 2000 (Parker, 2000). Overall, five studies, each preset at 30 trials, generated a direct hit rate of 36% ($p = .0012$, the mean chance expectation was 25%). One uncompleted study using previously successful participants has so far generated 5 hits in 29 trials (reported in Parker, 2003). In an effort to improve the efficiency of the ganzfeld system, Parker and Westerlund (1998), in collaboration with Jan Dalkvist of Stockholm University, developed a system in which all four film clips in a set could be used and not only the target film clip as is usually the case. This ganzfeld system was called serial ganzfeld since all four film clips in a set were used as targets in randomised order and the task of the receiver was to reconstitute this viewing order. The serial ganzfeld system was developed to make possible an evaluation of synchronous aspects of correspondences between the content of the film clips and the receiver mentation. These qualitative aspects might aid the understanding of how psi functions, since it is a way of trying to catch the phenomenon when it happens (Parker, 2003). It is also possible to use the real-time matches as a guide when evaluating a trial. One exploratory serial ganzfeld study was conducted generating a non-significant result, in part probably due to practical difficulties with the system (Parker & Westerlund, 1998). The digital autoganzfeld system presented in this paper was developed to overcome the practical difficulties with the serial ganzfeld system while still making use of the advantages of that system.

The Göteborg digital autoganzfeld system

A standard ganzfeld experiment is usually set up to detect telepathy. Thus, the experiment involves a “sender” who tries to affect the imagery of a “receiver” in accordance with the content of a randomly chosen target in real time. Although the experiment is set up to detect telepathy, a significant outcome might also be caused by psi phenomena other than telepathy, i.e. clairvoyance, precognition, or psychokinesis. When developing the Göteborg digital autoganzfeld system, the basic set-up of a telepathy ganzfeld experiment was used as a model.

One major advantage of the Göteborg digital autoganzfeld system is that the receiver's mentation report is captured and automatically stored as digital audio files. This is a feature which makes possible a playback with the film clips (picture and film sound) and the mentation (sound) exactly synchronised. If telepathy is indicated during a session and it follows normal time sequences, then there ought to be real time correspondences between the mentation and the target film clip. As a result of the exactly synchronised playback of the film clips and mentation, the task of finding these real time correspondences between the target film clip and the mentation is made easier for the person who is evaluating the trial. Apart from using the real-time correspondences as an aid in the evaluation process, they can also be used to investigate how psi works (Parker, 2003). Furthermore, they can be used to evaluate the relative importance of qualitative good hits. Another feature of the digital autoganzfeld system is the fully automated randomisation procedure, in which the computer program selects the target sets from the pool and the target clips from the sets, thus making the system more secure and more efficient compared to a manual ganzfeld. Furthermore, the set-up of our digital autoganzfeld system incorporates a new feature which allows two targets to be sent per trial rather than one. It saves time, money, and energy to be able to use two targets per session compared to the standard procedure. Furthermore, the mean chance expectation for a hit to occur in a standard ganzfeld experiment is 25%, but it is reduced to 6.25% for two correctly identified targets. This allows for the possibility to measure personality- and other variables in a group of people where the chance expectation for every individual is reduced to 6.25%, thus making chance variation less likely to affect the result of these measures.

Aim

The main purpose of this study was to evaluate how well the new digital autoganzfeld system works. In order to do so, the study was set up as a standard telepathy ganzfeld study using the newly developed experiment and judgement software (see the Appendix for a description). Moreover, variables that in earlier studies have been found to relate to study outcome were explored.

Psi conduciveness

A number of variables possibly related to study outcome have been identified in earlier ganzfeld studies. Bem and Honorton (1994) stated that in order to maximise the effect size it was important to create a warm social ambience in the laboratory; to use participants with characteristics reported to correlate with successful ganzfeld performance, and to use dynamic targets rather than static ones. The present study sought to make the experimental series as psi conducive as possible and to explore variables that might have an impact on the study outcome.

Receiver characteristics

Receivers who believe in psi and have had personal psi experiences are more successful in psi experiments (Bem & Honorton, 1994). Extraversion might be another predictor of experimental success but has shown different results in different studies (Dalton, 1997; Honorton, Ferrari & Bem, 1998; Parker, 2000). In the present study, we aimed to recruit participants who believed in psi and reported psi experiences. Other receiver variables that might be related to experimental success were measured but the results from these variables will be reported in a separate paper.

Sender-receiver pairing

A meta-analysis of early ganzfeld studies (Honorton, 1985; Honorton et al., 1990) showed that large effect sizes occurred in studies where friends of the receivers could serve as senders. The subsequent analysis of autoganzfeld experiments (Bem & Honorton, 1994; Honorton et al., 1990) showed that sender-receiver pairing correlated non-significantly with ganzfeld success. However, trials in which receivers had brought their friends to serve as senders yielded a hit rate of 35% compared to the 29% hit rate of trials that used staff senders. Contrary to this result, Parker (2000) reports a non-significantly higher hit rate for trials where staff senders were used. Broughton and Alexander (1997) report exceptionally high hit rates for parent/child (43.5%) and sibling (71%) sender-receiver pairs but a low hit rate (16%) for friends. Because of these conflicting results, it was decided that the present study would explore the impact of sender-receiver pairing on the ganzfeld result.

Experimenter effects

Experimenter effects have been reported in ganzfeld studies. It has been shown that some experimenters, because of their own psi ability or psychological effects (see for example Honorton, Ramsey & Cabbibo, 1975; Parker, 1975b; Rosenthal, 1980; Smith, 2003; White, 1976), seem to produce above chance results, while others produce chance or below chance results (Morris, Dalton, Delanoy & Watt, 1995; Parker, 2000). Because of this, it was decided to investigate possible experimenter effects in this study.

Target

Little is so far known about the role of the targets used in ganzfeld studies apart from dynamic targets yielding more hits than static ones (Bem & Honorton, 1994). People differ in their opinions and preferences and it might be difficult for the sender to keep up enough interest and be able to concentrate on the target content for the required time if the target does not affect him or her. Also, if the target does not affect the receiver, this might prevent him or her from getting clear impressions from it. Thus, it was decided to investigate the role of the target.

Confidence of trial success

The receiver's belief that she or he will succeed in a ganzfeld trial might have an impact on the result. If hitters are more confident than missers post-ganzfeld this might be due to their experience of something really happening during the ganzfeld trial (Pettersson, 1998). An earlier study (Pettersson, 1998) showed that both hitters and missers were more confident of success pre test than post test, and that hitters were more confident of success post test compared to missers (Parker, 2000). The relation between experimental success and confidence of success prior to and after the sending period will be explored.

Hypothesis and Data Analyses

Prior to the beginning of the study the following hypothesis was pre-specified:

1. The digital ganzfeld result will statistically significantly exceed the mean chance expectation (p=.25) as measured by direct hits, the sessions being evaluated by an external judge. The statistical test was pre-specified to be a binomial, one-tailed test. The alpha level was set to .05. The ganzfeld result was a hit if the target film clip was ranked as number 1 and a miss if the target film clip was ranked as number 2, 3 or 4.

   After the study started, but before the start of the ganzfeld data collection, there were reservations against only using an external judge. At that point in time, the participants had already received information about the study, including the approximate time they needed to set aside for the experiment. Therefore, it was not possible to request the participants to spend the extra hour in the laboratory that was needed for them to evaluate their own sessions. Instead, it was decided that the receivers willing to do so would evaluate their own sessions but it was not demanded of them. The receiver evaluations were analysed using a binomial two-tailed test. Since there were two analyses of the same data, the alpha level was adjusted using the Bonferroni inequality (Rosenthal & Rubin, 1984). The adjusted alpha level was calculated by dividing the criterion of significance (.05) by the number of tests of the ganzfeld result (2). After the adjustment, the result of the evaluations need to be associated with $p < .025$ to be regarded as significant.

During the sessions that were evaluated by the receivers, one main experimenter (AG) discovered that at times she did not agree with the receivers' evaluations of their sessions and therefore started to write down her own evaluation. The decision to do so was taken during the data collection period and any analysis based on the experimenter's evaluation was considered to be post hoc.

Prior to the beginning of the study the following exploratory analyses were planned:

2. Three 10-point rating scale statements concerning the pre-trial creation of a warm social environment, feeling of affinity and understanding between the participants, and expectation of success will be analysed with t-tests to explore differences between hit trials and miss trials.

3. Investigate if there is a relation between the sender and receiver relationship (None, Relative, Friend, Spouse) and the ganzfeld result. A one-way analysis of variance will be used since the ganzfeld result is defined as the target ratings for this analysis.

4. Investigate if there is a relation between the identity of the experimenter and the ganzfeld result. A $\mathcal{X}^2$-test will be used because the level of measurement is nominal for both variables.

5. Investigate if the receivers' and senders' judgement regarding the effect of the target film clip is related to the ganzfeld result. The

receivers and senders will be asked to rate how much the target film clips affect them, using a 10-point rating scale, and the differences between hit trials and miss trials will be explored with t-tests.

6. Investigate if there is a relation between the receivers' confidence of success in the ganzfeld prior to and after the sending period and the ganzfeld result and if the overall level of confidence of success is the same both before and after the sending period. The between group's effects will be explored using independent t-tests, whereas the within group effect will be explored with a paired t-test.

Analyses 2-6 were planned to use the judge's assessment of the ganzfeld trial. The ganzfeld result was a hit if the judge correctly identified the target film clip (ranked target as number 1) and a miss if the judge failed to identify the target film clip (ranked target as number 2, 3 or 4). For analysis 3 and above, the judge's assessment of the target ratings was used. The alpha level was .05 for all analyses.

Method

Participants

It was pre-specified that 128 ganzfeld trials were going to be run using novice participants. An advertisement was placed in the main morning paper in the Göteborg area asking for participants who had had paranormal experiences and who were interested in participating in the study. Participants contacted the researchers via telephone and those who claimed that they had had paranormal experiences; did not show obvious signs of psychological disturbances; were over the age of 18, and had not previously taken part in a ganzfeld study were sent a pack of information about the study and questionnaires to fill in and return. When the questionnaires had been returned the participants were contacted by the first author and a date for a ganzfeld experiment was decided on. (The results of the questionnaires will be reported separately). 64 individuals took part in the study, 54 women and 10 men. The mean age was 46.8 years (*SD*=12.3). The participants were encouraged to bring with them a person who could act as a sender for the ganzfeld session. The participants who did not bring their own senders were assigned a sender. 19 of the 64 participants brought their own senders with them. All 64 participants were asked to evaluate their sessions; 32 participants agreed to do so.

Two persons acted as experimenters during this study (AG and PM). Three staff senders participated in the study (AG, PM, and IH), all of whom were women. All had participated in ganzfeld trials before, both as receivers and senders, and one (AG) had acted as experimenter before. Both PM and IH are friends of AG and they were recruited to assist AG during the data collection. Both had studied psychology and were interested in parapsychology. Other volunteers took part in the beginning of the study as experimenters and senders but were unable to continue.

One person acted as an external judge (JW). His training consisted of participation in ganzfeld trials as sender and receiver, studying qualitatively good "hits", and evaluating ganzfeld trials.

Equipment

General layout of the experimental suite: The experimental suite consists of two rooms in the basement of the Psychology Department at Göteborg University called the sender room and the receiver room (see Figure 1). The distance between these two rooms is approximately 30 metres. The receiver room is sound attenuated (>48dB).

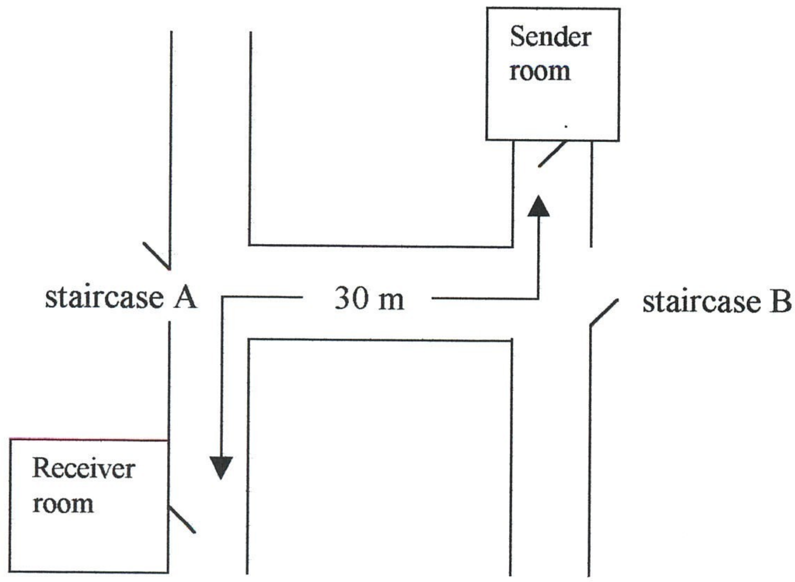

Figure 1. Layout of the sender and receiver rooms. Both rooms lack windows.

Receiver room equipment: In the receiver room there is a PC IBM Aptiva computer containing the ganzfeld judging software (see Appendix) together with an Ilyama Vision Master Pro 450 computer screen adjusted to 1024 x 768 pixels, and a computer mouse and keyboard. The computer is connected to the Internet to enable retrieval of the mentation sound files from the file server. This equipment was only used if the receiver evaluated his or her own ganzfeld trial. An Astatic 900 microphone with a STM low-noise microphone preamplifier is connected via a cable to the computer in the sender room. This enables the sender to hear what is said in the receiver room but since the connection is one-way, the people in the receiver room cannot hear anything from the sender room. The receiver is seated in a reclining chair during the trial. There is also a cassette recorder, headphones, and cassette tape containing 10 minutes of relaxing music and 30 minutes of white noise, together with ping-pong goggles and a 40W red lamp in the receiver room. This equipment is used by the receiver during the trial. The experimenter sits at a desk with a cassette recorder and amplifier that records the mentation as backup.

Sender room equipment: The sender room has a PC Desk station 866/133 MHz Pentium III computer containing the ganzfeld experiment software. The computer has a 46.1 GB IBM Deskstar Ultra ATA-100 hard drive, an ATI Xpert 2000 Pro 32 MB AGP TV-OUT graphic card, and a Creative SB PCI 128 integrated soundcard. There is a 22″ Ilyama VM Pro 510 computer screen with 1024 x 768 pixels resolution and a computer mouse. The computer is connected to the Internet to enable automatic storage of mentation sound files onto a file server. The sender wears headphones to listen to the film sound and what is said in the receiver room.

External judge equipment: The equipment used by the external judge is placed in his home in Stockholm. The external judge has a PC with a Windows 98 platform containing the ganzfeld judging software, a NEC MultiSync FE700 computer screen, adjusted to 1024 x 768 pixels, and a RageFury Pro/Xpert 2000 graphic card. The computer is connected to the Internet to enable retrieval of the mentation sound files from the file server.

Safeguard considerations

Pre-specifications: In accordance with the recommendations by Milton and Wiseman (1997), the following decisions were written down and filed with a person not involved in the study before the data collection began:

1. The number of ganzfeld trials in this study is going to be 128. Since every ganzfeld session generates two ganzfeld trials then 64 receivers are needed for the study.
2. The experimenter has the right to declare a ganzfeld trial invalid if any of the following occurs:
   (a) If the receiver has been silent during any of the two 15- minute sending periods, because then no judging can de done.
   (b) If a ganzfeld trial has been interrupted.
   (c) If the door to the sender room has been opened during the session.
   (d) If there has been communication between the Göteborg laboratory and the external judge before the evaluation of sessions have been done.
3. Hypothesis and analyses as specified earlier.

Sensory shielding: Two types of possible sound leakage were considered. The first was acoustic leakage between the sender and receiver rooms. The second was electrical leakage from the output video sound from the sender computer soundboard to the input video sound in the sender computer soundboard. The output sound is the target film clip sound, whereas the input sound is the sound from the receiver room. If somehow there is a leakage then there would be cues in the form of the target film clip sound on the computer file containing the mentation, which is the sound file the judge has at his or her disposal during the evaluation process. Because of this potential problem, a professional sound technician was hired to conduct measurements.

The conclusion regarding the acoustic leakage measure was that the attenuation between the receiver and sender rooms was high but it was not proved that high sound levels at certain frequencies could not be heard in the receiver room (Granqvist, 2001). For example a trained singer might be able to achieve a sound level at these frequencies (Granqvist, 2001). Some recommendations were made to ensure that sounds from the sender room could not be heard in the receiver room. These were that: (a) background noise and hearing protectors could be used by the receiver, (b) the sound in the sender room could be recorded, and (c) the sender could be instructed not to use his or her voice to communicate. During the ganzfeld trial (a) the receiver wears headphones and listens to 10 minutes of relaxing music followed by 30 minutes of white noise, (b) it was not possible at this point in time to record the sound in the sender room, and (c) the sender is instructed to silently communicate during the session. Moreover, the sender does not have loudspeakers in the sender room during the session and thus is forced to use headphones in order to listen to the target film sound and the mentation. During the measurements of sound levels on the other hand, loudspeakers were used in the sender room.

The conclusion regarding the electrical leakage measure was that the cross-talk levels were low and safe if 8-bit sampling was used (Granqvist, 2001). In order to be on the safe side, it was recommended that separate soundboards were used (Granqvist, 2001). Accordingly, 8-bit sampling and different sound cards for the mentation and the film sound were used, thus preventing the film sound from being present together with the mentation.

Sender room: Since the sender is left alone in the sender room during the session, an alarm system was installed that would alert the experimenter in the receiver room if the door to the sender room was opened. This alarm system consisted of a magnet on the sender room door connected to a red alarm lamp in the receiver room. As a further precaution to prevent the sender from being able to make changes to the computer program, the activity bar containing the start button was hidden, thus making it impossible to use the computer mouse to make changes. Moreover, the keyboard was removed from the sender room during the session.

Judging: The external judge was not allowed to have any contact, indirect or direct, with anybody working with or taking part in the ganzfeld experiments before all experiments that had been conducted also had been judged. The ganzfeld experiments took part in Göteborg and the external judge was situated in Stockholm, about 400 kilometres away. After the external judge had assessed a ganzfeld trial he e-mailed the result to the main experimenter and to a person not involved in the ganzfeld study for record-keeping.

Data checking: The data from the experiments was transferred to a SPSS data sheet. Parts of the data were transferred by one person and double checked for correctness by another, whereas other parts were transferred to the SPSS data sheet and double-checked three weeks later by the same person.

Pilot study

Before the formal study started, a pilot study was conducted in order to test the ganzfeld experiment and judgement programs. The number of trials was not specified beforehand and the trials were not formally judged. During the pilot study, changes were made to the ganzfeld experiment and judgement programs. The pilot study was finished when the software was working correctly. For detailed information about the ganzfeld software, see the Appendix.

Materials

Registration form

A registration form was used that contained information about the identity of the experiment, sender and receiver identity, and relation between sender and receiver. It also contained some questions to be answered by the participants. The first question concerned the receiver's confidence of success with the experiment. The question was: "How sure are you that the telepathic transference will succeed?" The answering format was a 10-point rating scale with the end points, 1 "totally unsure" and 10 "totally sure." This was asked both before the sending started and after the sending finished. The second question was concerned with the ability of the target film clips to affect the sender and the receiver. The question was: "Did the target film clip affect you?" The answering format was a 10-point rating scale with the end points 1, "it did not affect me at all" and 10 "it affected me a lot".

There were also three statements for the experimenter concerned with some psychological effects. The first statement was: "A warm social environment was created before the start of the ganzfeld experiment". The second statement was: "A feeling of affinity and understanding between the participants and the experimenter was created before the ganzfeld experiment". The third statement was: "Expectation of a successful ganzfeld experiment was created among the participants before the ganzfeld experiment". The answering format for these three statements was a 10–point rating scale with the end points 1, "to no extent at all" and 10 "to a large extent".

Instruction sheets

Instruction sheets for the experimenter and the sender were created. For the experimenter, the instructions concerned the whole procedure, from welcoming the participants, to the feedback after the experiment was finished. The sender instructions followed the ones used by Dalton (1997). The sender was instructed to communicate his or her thoughts and the target content silently and some advice was given about the sending process.

Target pool

The targets were digitised dynamic film clips installed on the computer hard disk. Targets were chosen by AG and AP and put together into 25 sets of 4, each clip being 2 minutes long. The four film clips within a set were chosen on the basis of being as different from each other as possible with regard to content. It has been recommended that good psi targets should be meaningful and have human interest (Watt, 1988). Thus, the clips chosen were clips that we thought would be interesting and meaningful for the participants. The film clips included sequences from motion pictures, documentaries, and television shows.

Procedure

The participants were welcomed by the experimenter (and the appointed sender when appropriate) and were offered coffee, tea, or soft drinks. Before the ganzfeld experiment started, the experimenter explained the experimental set-up and what was expected from the participants. The participants were showed the sender and receiver rooms and the equipment to be used. The registration sheet was filled in by the experimenter throughout the session.

The sender was installed in the sender room, equipped with headphones and a computer mouse, and seated in front of the computer screen. The sender was instructed to use the computer mouse and click on a button labelled "Show films" when requested to by the experimenter. The sender was told to communicate the film content silently and to stay in the sender room without opening the door until the experimenter and receiver returned.

When arriving at the receiver room, the receiver was asked the question concerning her or his confidence of success in the experiment. The receiver was equipped with headphones and ping-pong goggles and was instructed that the session would start with 10 minutes of relaxing music. When the white noise started, the sending started and then it was time for the receiver to verbalise anything that entered his or her mind. The white noise continued throughout the session without an indication of when the targets changed. The experimenter filled in the three statements regarding the creation of a warm social ambience and expectation of experimental success.

After ten minutes, the experimenter told the sender, via the one-way communication system to start the experiment session by clicking on the button "Show films". The sender watched the film clips on the computer screen while listening to the film sound and the mentation through headphones. The experimenter wrote down the mentation during the session.

When the sending period was over the equipment was turned off. The receiver was again asked a question about confidence of success in the experiment. An external judge evaluated all sessions and the receivers also judged half the sessions. If the receiver was going to evaluate his or her session, the experimenter and receiver stayed in the receiver room to do so. The receiver was shown the four film clips in the set belonging to the first half of the experiment. The receiver could choose to view the film clips one or two at a time while at the same time listen to the mentation. The receiver could choose to listen to the whole of the mentation or to parts of it. It turned out that none of the receivers wanted to listen to the whole mentation. The experimenter still went through the whole mentation with the receivers by referring to her notes. When the receivers felt ready, they rated the similarity between each film clip and the mentation on a rating scale ranging from 0 (no similarity between film content and mentation) to 100 (strong similarity between film content and mentation). Thereafter the procedure was repeated for the second half of the experiment. Then, the experimenter and receiver went to join the sender in the sender room for feedback.

If an external judge alone was going to do the evaluation, then the receiver and the experimenter joined the sender in the sender room directly after the sending period for feedback. If the receiver brought his or her own sender along, the sender would stay in the sender room with the door closed while the receiver evaluated the experiment. The sender could still hear what was said in the receiver room but could not see the film clips the receiver had to choose from. If an appointed sender was used, she had the option to leave the sender room after the sending period via staircase B (see Figure 1).

The feedback for the session is incorporated in the ganzfeld experiment program, see the Appendix for details. The computer feedback shows the two target film clips together with the mentation. This means that the receivers who do not judge their own sessions never watch the decoys of the target sets. When each of the target film clips had been shown, both the sender and receiver were asked questions about the target (see the Materials section above). The participants were thanked for their participation and given a little token of appreciation in the form of a 50 kronor voucher.

The external judge accessed the file server via the Internet and collected the mentation files. Mentation files and information about which set of film clips had been used in a session were collected, but no information about the target identity. The external judge went through the same evaluation procedure as described above. However, he had some training in evaluating ganzfeld protocols and was more systematic in doing so, compared to the receivers. He listened to all the mentation and book-marked the sections where the mentation appeared to be the same as the film content. After he finished the judging he e-mailed the result to AG. When all experiments that had been conducted also had been judged, AG e-mailed the external judge to give him feedback about which film clips were the targets for the sessions he had evaluated. AG also gave the receivers feedback about the judge's assessment via telephone or mail.

Results

The digital autoganzfeld result of the judge's evaluations (N = 128) was a direct hit rate of 23%, which was close to chance expectation ($p = .386$, one-tailed binomial test). The effect size, π (Rosenthal & Rubin, 1989), was .47 where .50 is expected under the null hypothesis. The result of the receivers' evaluations (n = 64) was a direct hit rate of 14% (binomial two-tailed test; $p = .050$). The effect size, π was .33. After adjustment of the alpha level using the Bonferroni inequality (Rosenthal & Rubin, 1984), both results failed to reach significance ($p < .025$).

The external judge's assessments of both these two groups of ganzfeld trials showed that the ganzfeld trials which had been evaluated by both the external judge and the receivers produced 27% hits, whereas the ganzfeld trials which had been evaluated by the external judge only, produced 20% hits. The post hoc result of the experimenter's evaluations (n=62) was a direct hit rate of 21%, which did not deviate from chance expectation.

There were no significant differences between hit trials and miss trials regarding the pre trial creation of a warm social environment, feeling of affinity and understanding between participants, and expectation of success. Both hit trials and miss trials were associated with high means on the three questions (means between 7.2–8.5; theoretical range 1–10).

There were significant differences in the ganzfeld results across the groups of sender-receiver relationships ($F_{3,124} = 4.5$, $p = .005$). The ganzfeld results were measured by the target ratings of the external judge. There were four kinds of relationships: None (an appointed sender), Biological relative, Friend, and Spouse (see Table 1). A Tukey post hoc test showed a significant difference ($p = .002$) between the target ratings of those ganzfeld trials of receivers who brought a friend with them, compared to those who did not bring a sender of their own (the None group).

Table 1: Percentage of hits, number of trials, means, and standard deviations for the four types of sender–receiver relationships

Kind of relationship	None	Biological relative	Friend	Spouse
Hits (%)	18.9	16.7	45.5	20.0
n	90	6	22	10
M (*SD*) target rating	27.3 (22.0)	27.0 (24.9)	47.6 (29.9)	35.7 (20.9)

There was no significant difference between the ganzfeld results due to different experimenters. There were two main experimenters in this study; AG who supervised 100 ganzfeld trials, of which 25 (25%) were hits and PM who supervised 26, of which 5 (19%) were hits. An experimenter is here described as the person who is responsible for taking care of the receiver and thus supervising the experiment.

However, the result of this analysis might not be a fair estimate of an eventual experimenter effect since in the majority of the trials (n = 90) there was also an appointed sender involved. If there are any experimenter effects in this study the appointed sender might have contributed to them as well as the experimenter since both the experimenter and appointed sender were responsible for the creation of rapport and dialogue with the receiver, and for the creation of the socially warm environment thought to be important in ganzfeld research (Honorton et al., 1990). Therefore the trials were divided into experimenter teams. There were five experimenter teams involved in the study. A one-way ANOVA was conducted to investigate differences in the ganzfeld results between these five experimenter teams. The ganzfeld result was measured by the target ratings of the external judge. There were no significant differences between the experimenter teams.

There was a significant difference between hit trials and miss trials regarding the target affect for senders ($t_{124} = -2.4$, $p = .016$, two-tailed) but no difference regarding target affect for receivers. In successful ganzfeld trials senders regarded the target film clips as having affected them more (M = 7.1, *SD* = 2.0) than was the case in non-successful ganzfeld trials (M = 5.9, *SD* = 2.4).

Confidence of success was measured both before and after the sending period. The hit trials (M = 6.2; *SD* = 2.2) were associated with higher confidence of success pre sending ($t_{116} = -2.0$; $p = .049$, two-tailed) compared to the miss trials (M = 5.2; *SD* = 2.3). The difference between the groups post sending failed to reach significance ($p = .064$) but was in the expected direction with hit trials associated with higher confidence than miss trials. Both the hit- and the miss trials were associated with higher confidence of success before (M = 5.4; *SD* = 2.3) compared to after (M = 4.6; *SD* = 2.6) the sending period ($t_{117} = 4.1$; $p = .000$, two-tailed).

During the ganzfeld experimental series three sessions were excluded. The first one was excluded because the ganzfeld experiment program installed in the sender room computer interrupted the ganzfeld trial halfway through the session when only one target had been shown. The interruption meant that the computer shut down and did not save the mentation file from the first part of the session so not even that part of the session was possible to evaluate. The receiver who took part in this trial wanted to come back when the technical problems had been solved and was invited to do so. However, since the receiver was now no longer a ganzfeld novice and it had been pre-specified that only ganzfeld novices should take part in this study, then this second experimental session was excluded. The third session that was excluded was a session in which the receiver had not understood the instructions about what to do during the sending period. This became clear to the experimenter during the sending period. The experimenter decided to interrupt the session before returning to the sender room since it would not be possible to evaluate it.

Discussion

The main purpose of this study was to evaluate how well the newly developed digital autoganzfeld works and thus if it can be used to investigate psi. In designing this study it was reasoned that the digital autoganzfeld would be superior to other ganzfeld set-ups in detecting psi because of the enhanced power resulting from the use of two targets per session, and because of the judgement program which was constructed to make the judgement process easier. However, the pre-specified hypothesis regarding the ganzfeld result was not confirmed. The direct hit rate of the external judge was close to the mean chance expectation, a result that does not support the idea that the real-time digital autoganzfeld is superior compared to other ganzfeld set-ups. The low direct hit rate of the receivers' own evaluations was significant before the adjustment of the alpha level but not after. However, the hit rate was in the psi missing direction. Psi missing is not an unknown phenomenon in parapsychology and it can for example occur due to defensiveness or low motivation (Johnson & Nordbeck, 1972). In the present study, the latter might be a likely candidate. The participants were certainly highly motivated during the receiving part of the experiment but none of the participants who did their own evaluations had the patience or interest to spend the time needed to do the evaluation in the way it was planned, using the evaluation computer programme. Instead, the evaluation procedure was similar to that of a standard ganzfeld. The experimenter presented the receiver with the four possible film clips, read the written mentation report to them, and let them watch as much of the film clips (while at the same time listening to the mentation) as was requested. During this process, the receiver concentrated on finding correspondences between the content of the film clips and the mentation. When the receiver felt ready, the judging was done. The low motivation during the evaluation process might explain the low hit rate of the participant evaluations.

The other results of this study might help to explain why the result of the judge's evaluations was only at chance level. Firstly however, the reliance on an external judge will be commented on.

The reliance on an external judge

After the study started there were reservations against only using an external judge. It was thought that this procedure might put too much pressure on the external judge. Although the study might have benefited from having more than one external judge to evaluate the trials this was impossible because of a lack of resources. The procedure with using an external judge also departs from the standard ganzfeld procedure, which relies on the receiver to do the evaluation of the trial with guidance by the experimenter. It could be argued that only the receivers, who have had their impressions during the sending period, can recognise them afterwards during the judging process. Accordingly, relying on an external judge might affect the result negatively. It was therefore decided that the receivers who wanted to evaluate their own trials would be welcome to do so. This meant that it was possible to compare the ganzfeld results of the external judge and the receivers.

However, it can also be argued that an external judge might be better at evaluating ganzfeld trials compared to receivers. The receivers do not have any training in evaluating ganzfeld trials and they do not have any experience of how ganzfeld target material might be displayed in a mentation report. In a survey of experimenters' views on free-response judging (Milton, 1991), it was concluded that there are many different views about how judging should be done but there are also general consensus on some aspects. Ideal judges should be patient, take their time, be highly motivated, and have training and experience relevant to judging the particular study. The external judge of the present study qualified for all this, while the receivers did not. Moreover, the external judge did a more thorough evaluation compared to that of the receivers and the experimenter. None of the receivers had the patience or motivation needed to go through the whole of the judging process as it was designed in the ganzfeld judging. The higher hit rate of the external judge might simply reflect that the external judge was better at judging. Moreover, it has been shown in a meta-analysis of free-response ESP studies without altered states of consciousness that higher effect sizes were obtained with independent judges than with receiver judges (Milton, 1997), a result that also might reflect that external judges better fit the requirements for being good judges. If the pressure on the external judge had a negative influence on the ganzfeld result, his evaluation would have been expected to generate a less successful ganzfeld result compared to those of the receivers and the experimenter. This was clearly not the case since the external judge generated the highest hit rate.

Disadvantages with the real-time digital autoganzfeld

A possible disadvantage with the digital autoganzfeld system is that it deviates from a standard ganzfeld set-up. Since it has been shown that standardness is related to study outcome (Bem, Palmer & Broughton, 2001), it is possible that the deviation of this set-up was an important factor behind the failure to detect psi. However, this would not explain why the group of receivers who brought friends as their senders would produce a high hit rate. Another possible disadvantage with this set-up was the focus on the synchronicity of the mentation report and the target content. Psi can have occurred despite a lack of real-time correspondences as for example would be the case with precognition. If too much weight is given to find real-time correspondences when evaluating a session, the result could be a false "miss". However, the judge who evaluated the ganzfeld trials was well aware of this and attended to all similarities between target and mentation before evaluating a trial.

In the case of precognition it is true that having two target film clips per ganzfeld session, with three decoy film clips belonging to each target clip might confuse the issue of judging the trials even more than if only one target film clip was used per session. One way of finding out if this was a problem in the study would be to compare the ganzfeld trials evaluated only by the external judge with those evaluated by both the external judge and the receivers. In the case of only external judging, the receivers never viewed the decoy film clips. If precognition was a problem then the trials evaluated only by the external judge would be expected to be superior in terms of hit rate to those evaluated by both the external judge and the receivers. The external judge's assessments of both these two groups of ganzfeld trials showed that the ganzfeld trials which had been evaluated by both the external judge and the receivers produced 27% hits, whereas the ganzfeld trials which had been evaluated by the external judge only, produced 20% hits. This difference between the two groups does not point towards a problem with precognition.

Another possible disadvantage with the digital autoganzfeld system also concerns the showing of two target film clips per session. This is a more complex situation compared to the standard procedure and might therefore affect the outcome negatively, especially if both sessions are judged at the same time. Although this was the case for the receivers who judged their own sessions, it is less likely to have been a problem for the external judge. He could choose when to evaluate a session and decide how much time to spend on each evaluation. However, if the receivers were affected by the complexity of the task, they would be expected to generate a worse result compared to the judge, which was the case here. This would still not explain why the judge's evaluations were only at chance level though.

Psi conduciveness

It has been argued that in order to detect psi the experimental set-up needs to be psi conducive. Bem and Honorton (1994) reported that in order to maximise the effect size it was important to use dynamic targets rather than static ones and to create a warm social ambience in the laboratory. Thus, the present study used only dynamic targets. The experimenters and appointed senders taking part in the study did their best to create the friendly and informal social atmosphere thought to be important for success in the ganzfeld. In an attempt to measure elements of the social atmosphere, the experimenter answered three statements, see the Materials section. The means for these statements were high, and there were no significant differences between hit trials and miss trials. From this it can be concluded that the experimenters felt that a warm social ambience had been created during the experimental series. However, it was a limitation of the study that the statements were answered by the experimenters and not by the other participants. Although it was clear from the results that there were no significant differences between hit trials and miss trials regarding these statements, had the other participants also answered the statements the result might have been different.

Bem and Honorton (1994) also point to correlations between psi performance and characteristics of the receivers. Personality and other receiver data was collected and will be reported in a subsequent publication. However, one important receiver characteristic is personal psi experiences (Bem & Honorton, 1994) and thus, all subjects taking part in this study reported personal psi experiences.

Sender-receiver pairings

The relationship between the sender and receiver might also affect the psi performance (Honorton et al., 1990). In the present study, there was a significant difference between the target ratings of those ganzfeld trials of receivers who brought a friend with them, compared to those provided with an appointed sender. This might indicate why the study failed to find psi. One can only speculate about what would have been the result of this study had it used friends as senders in all the 128 trials and not only in 22 as was the case.

Experimenter effects

Experimenter effects have been reported in ganzfeld studies (Parker, 2000) and it has been argued that for a study to be successful the experimenter should have a positive attitude towards psi (Wiseman & Schlitz, 1997; 1999). In the present study, an experimenter was defined as the person who was responsible for taking care of the receiver and thus supervising the experiment. However, because of appointed senders being involved in the majority of the trials and therefore maybe contributing to an eventual experimenter effect, a division was also made in terms of experimenter teams. There were five experimenter teams involved in the study. All experimenters and appointed senders had a positive attitude towards psi. The results showed no significant experimenter effects between the two experimenters, or between the experimenter teams. It was AG as sole experimenter who had the highest hit rate and mean target rating. This may be due to the fact that she acted as experimenter in all the trials in which the receivers brought their own senders. As was shown earlier, receivers who brought friends to serve as their senders produced the highest hit rates. It might also be because AG acted as experimenter in far more trials than PM (100 vs. 26).

Targets

There was a significant difference between hit trials and miss trials regarding the target affect for senders but no difference for receivers. In successful ganzfeld trials senders regarded the target film clips as having affected them more than was the case in non-successful trials. While this result is suggestive and interesting it has to be pointed out that the question regarding the target was put to the sender and receiver during the feedback period which might have affected the result. It might be the case that the sender was influenced by his or her thought of success or non-success of the trial in question. If the sender perceived the trial as successful she or he might have been more likely to give the target a high rating than if the trial was perceived as non-successful. However, the same reasoning might be expected to lie behind the receiver rating. If the receiver at feedback perceives the trial as successful she or he would rate the target higher than if the trial is perceived as non-successful. The result for the receivers was in line with this reasoning since the mean of the hit trials was higher than the mean for the miss trials but the difference was non-significant. So, whether the result regarding target affect constitutes a real effect or should be explained by the perception of the trial as successful or non-successful will have to await further experimentation.

Confidence in success

While the sheep-goat effect seems to be firmly established in psi research (Bem & Honorton, 1994), it might not only be the general belief in psi that is important for a study's outcome but also the receiver's belief that she or he will succeed in the particular trial she or he takes part in at that particular point in time. To investigate this, the receivers in this study were asked a question about their confidence of success in the ganzfeld, both prior to the sending period and after it had finished. In line with the reasoning of Pettersson (1998), hitters might be more confident pre sending than missers because a higher confidence might boost the chances to produce hits. Hitters might also be more confident than missers post sending since in the hit trials, information from the target film clip would be expected to have entered the awareness of the receivers. The receivers of successful trials showed significantly higher confidence of success than the receivers of non-successful trials pre sending. The hit receivers also were more confident compared to miss receivers post sending but the difference was non-significant. This pattern of results would be expected following the reasoning above. However, receivers of both hit- and miss trials showed higher confidence of success before the sending period compared to after the sending period. This is somewhat surprising since the hit receivers would be expected to show the same or higher confidence post sending as pre sending if they are aware of an information transfer taking place. This result is however, in line with that of Pettersson (1998; Parker, 2000), who showed the same effect in his study. One suggestion for the higher confidence pre sending compared to post sending is that during pre sending the participants have been affected by the positive success expectant attitude of the experimenter and appointed sender. The receivers might also have some kind of idea what the images they perceive during the sending period might be like. If this idea does not fit with how it really turns out, this in itself might make them less confident post sending. Some receivers actually said that the images they experienced during the sending period were much more unclear and sometimes unexpectedly bizarre, which might lend support to the above speculation.

Concluding remarks

A strength of this study was that it took notice of the importance of psi conduciveness and also reported aspects of psi conduciveness, something that other studies have been criticised for not doing (Milton & Wiseman, 1999). The deviation from a standard ganzfeld protocol can be seen both as a limitation and strength; certainly we thought that the new digital autoganzfeld would be superior compared to the standard ganzfeld. The main purpose of the study was to evaluate how well the newly developed digital autoganzfeld worked. Technically, it worked very well. However, although the study was set up to optimise psi conduciveness it failed to give significant psi hitting.

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Appendix

The digital autoganzfeld system

The digital autoganzfeld program, written by Joakim Westerlund, consists of two software components: one for running a ganzfeld experiment and one for judging a ganzfeld experiment. The software was developed in Visual Basic to run on Windows 98 with Microsoft Mediaplayer 6.4. It is possible to choose to run the software in Swedish or English

The digital autoganzfeld experiment program

The software for running a ganzfeld experiment is installed on a computer in the sender room and is run from there. The ganzfeld experiment program is written so that the first window to appear on the computer screen when starting the program is an apparatus test. It allows the experimenter to test that the sound from the receiver room is recorded in real time. After the sound test is done, the next window on the computer screen is for setting the specifications of the ganzfeld trial.

First, the kind of trial has to be specified. There are four different choices: testing the program, pilot trial, experimental trial, and demonstration. If the choice is testing the program or demonstration, then it is possible to set the time for each film clip to be shown. The default is that each film clip is played seven times (14 minutes and 21 seconds). This default cannot be changed when running a pilot or experimental trial. There is also a choice as to who decides on the random number generator (Visual Basic pseudorandom algorithm) seed. It can be the computer, the experimenter, or the receiver. If the computer or the experimenter is chosen then the seed sets to the system clock at the moment the first window on the screen is closed. Although the two options do the same thing, they can be used to manipulate the experimenter's expectation. If on the other hand the receiver is chosen then the seed sets to the system clock at the moment the receiver confirms that she or he has read the instructions for the session (which is the next window on the screen). In this study, the computer was chosen. It is possible to decide on who is going to evaluate the session, the receiver or an external judge. Depending on the choice, different instructions are given on the screen to the sender after the end of the sending period. There is nothing to stop an external judge to also evaluate the session even if the receiver has been chosen to do the evaluation. The window also shows possible film sets, i.e. all the film sets available at that point in time. There is a choice to remove film sets, which would be of prime concern with repeated testing of the same individuals. The removed sets then appear in a removed sets box. It is also possible to investigate which film clips are included in a particular set. Also, there is a box for information about who is the experimenter during the ganzfeld session and also a box for comments that can be used if needed.

When all choices have been made, the questions have been answered, and the computer clock has been checked, it is time to click OK to continue. All the above information about the ganzfeld experiment is automatically saved as a text file together with information about target identities for the session, the date, and the time the sending of the film clips started.

The next window to appear on the computer screen is a text welcoming the participants to the experiment and giving them some information about what will happen during the experiment. When the participants have read this information they click on OK and the next window appears. The purpose of this window is for the sender to be able to practise using a slide bar to adjust the relative volume level of the sound from the film clip and from the receiver mentation. When the sender feels satisfied with the practice, a click on OK is required to move on to the next window on the screen. This is the last one shown before the start of the sending period. The following instructions are given: "The receiver should now go to the receiver room. The sender stays in the sender room. When the sender is given the starting signal from the experimenter she or he should click on the button underneath labelled 'Show film clips."' This starts the sending period.

The computer randomly selects a target film set and a target film clip from that set and starts showing this for the sender. Targets are put together into 25 sets of 4, each clip being 2 minutes long. Each target film clip is shown to the sender 7 times. Before the repetition of a target film clip there is a 3 second pause when the computer screen turns blue. When the target film clip has been shown 7 times, the computer repeats the sending procedure for the second target. Thus, two target film clips are being shown during one ganzfeld session. The sending period lasts for 28 minutes and 42 seconds.

While the sender is watching the target film clip, the receiver mentation is recorded and stored on a computer file. When the sending has finished, the computer program copies the two mentation sound files (one for each target film clip) onto a file server. The sound file names contain information about which target film sets were used but there is no information about which films in these target sets were used as the actual target film clips.

When the receiver and experimenter arrive to the sender room after the session has finished, feedback is given regarding which targets were used during the session. This feedback is incorporated in the digital autoganzfeld experiment program. The computer shows the target film clips together with the relevant mentation. When the participants are satisfied with the feedback, the last window on the screen appears. This contains a summary of the ganzfeld session that is printed out for storage.

The digital autoganzfeld judgement program

The software for running the judgement program is installed on the computer in the receiver room and also on the computer used by the external judge. Figure 2 shows how the computers are linked to the file server onto which the mentation sound files are copied. Both the receiver and the sender room computers are directly linked to the Psychology Department file server. The external judge has to collect the mentation files from the server by connecting his computer to the Internet and use special access codes to get into the server. The different computers are not directly connected to each other.

The judgement program starts when a mentation sound file is opened. There are then four boxes on the screen that contain thumbnails depicting the film clips in the film set belonging to the opened mentation sound file. The thumbnails are shown in randomised order. Any one or two film clips can be shown simultaneously by ticking small boxes underneath the chosen thumbnails and then clicking on a button labelled: "Show checked movies". It is possible to adjust the relative volume levels and it is also possible to for example only listen to the mentation sound while watching the film clips. Underneath the boxes in which the film clips are shown there are buttons to play, pause, and stop the films.

However, if one wants to synchronise the mentation sound with the showing of

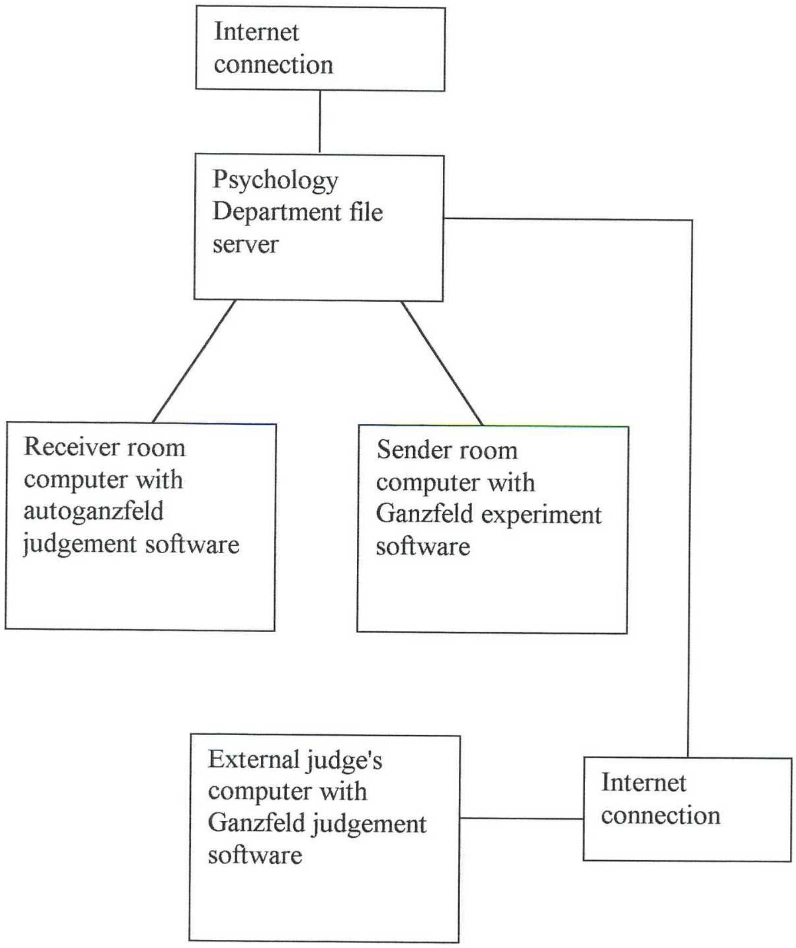

Figure 2. Schematic detailing how the different computers are connected to the file server and the Internet.

the film clips then some other buttons should be used instead. These buttons control the mentation sound as well as the film clips. There is a mentation sound slide bar that can be used to navigate to different parts of the mentation by using the computer mouse to click and draw. There is also a box that shows the sound waves of the mentation. This allows the judge to discover periods when the receiver has been silent. The judge can then skip these periods by using the mentation sound slide bar. If she or he does not want to use the slide bar, buttons labelled "Forward 5 sec" and "Back 5 sec" can be used instead to forward or rewind the mentation sound and film clips 5 seconds. Whenever the mentation sound is forwarded or rewound using the slide bar or the buttons, the film clips are automatically synchronised with the mentation sound. If there are correspondences between the content of the film clip and the mentation, it is possible to bookmark these. The bookmarks are automatically saved in a text file.

When the judge has watched all four film clips and wants to rate the film clips, a button labelled "Judge correspondence" is pressed. Then a different window on the screen appears. This window shows slide bars attached with thumbnails of the film clips. The rating scales range from 0 (no correspondence between film content and mentation) to 100 (strong correspondence between film content and mentation). The task of the judge is to move the slide bars with the computer mouse to the preferred rating for each film clip. It is impossible to give the same rating to two film clips. The rating figure is shown when the judge uses the computer mouse to move the slide bar. When all the film clips have been rated the button: "Exit judgement" is pressed. Then the ratings are saved in a text file together with the name of the judged mentation file, the thumbnail presentation order of film clips, and the date and time.

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Book Review

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A Review of "The PK Zone: A Cross-Cultural Review of Psychokinesis (PK)", by Pamela Rae Heath (2003)

This book has three parts. Part I reviews anecdotal PK cases with special reference to historical and cross-cultural material; Part II, which also has a certain historical slant, considers research on PK, not just of the narrowly experimental kind, and adds a little about theories of PK; and Part III, though it looks at one point into possible overlaps between PK and ESP, is mostly about the author's own researches into the phenomenology of PK, that is into the kind of experiential states which certain individuals 'who performed what appeared to be PK' regarded as being characteristic of and so perhaps conducive to successful performance.

Parts I and II can be taken together. Their leading feature is the great variety of phenomena surveyed - not just poltergeists and physical mediumship, say, or conventional PK experiments or experiments on biological systems, but, e.g., levitation, bilocation, stigmata, anomalous healing, metal bending, psychic photography, body luminosity, alleged paranormal control of the weather, and the performances of martial artists, and of such macro-PK superstars as Nina Kulagina and Felicia Parise. Much of this material will be sniffed at by high-and-dry experimentalists for whom anything that cannot be reproduced in a laboratory probably doesn't happen. Certainly it would be most unwise to accept such material without very careful scrutiny. But, where a given phe-

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nomenon has a certain degree of evidential support, it might be equally unwise to pass it over just because it does not fit easily within the conventions of experimental parapsychology. To do so would be to lose sight of where and why the whole parapsychological movement began. And this could prove especially counter-productive at the present time, when so much of laboratory parapsychology is nothing like the exciting and apparently successful enterprise that it has been in decades gone by.

I applaud, therefore, the broad range of varied phenomena encompassed in Dr. Heath's survey, and not just for the added entertainment value. But the very breadth of the survey carries certain, perhaps inevitable, penalties. A great deal of the material comes from secondary sources, some of which I would not rate as altogether reliable. And only rather rarely are we presented with evidence sufficiently detailed to permit readers to assess it for themselves. We are told that there is evidence but not shown why we might regard it as trustworthy. And there are rather a lot of small errors, oversights and other signs of haste. For example, we are told (p. 67) that D.D. Home was illegitimate – he was not, though his father was; Charles Richet's Christian name is given (p. 127) as 'Claude'; it is at least odd to find Francisco Suarez (perhaps the most distinguished Catholic philosopher and theologian of his time) referred to as 'a Spanish priest named Father Suarez'; on page 65 I am said to have 'attributed both the rapid rise, and the equally rapid fall of Spiritualism to the commercialisation of physical mediumship,' though I cannot remember ever holding, and trust that I have never expressed, such a hugely over-simple view; on page 112 it is stated that in the seventeenth century Joseph Glanvill 'developed a questionnaire for case histories', which so far as I know he did not; Eusapia Palladino is several times spoken of in rather unflattering terms with no mention of the most interesting investigations of her (Paris 1905–8 and Naples 1908). One could go on. I am sure that most of these oversights are the result of trying to cover a great deal of ground too quickly.

Part III sets out the author's phenomenological analysis of the accounts which she obtained from eight apparently successful PK agents of their states of mind when exercising their peculiar talents. The aim is to elicit key features or 'constituents' of these experiences (i.e. features which facilitate the PK) and to note the interactive patterns they form with each other. Detailed comparisons are drawn with proposals and conclusions already in the literature. The fourteen constituents eventually arrived at include an ASC involving a narrowed focus of attention, loss of awareness of surroundings, and an altered sense of time; a sense of interconnectedness to the target or to other people; feelings of dissociation or detachment; suspension of the intellect; playfulness or heightened emotion; a trust in the process; openness to the experience; and investment in the upshot. From these constituents Dr. Heath derives a set of 'tips for PK beginners', which are all very well, but by no means completely novel. What is really needed here are some tips for the attainment at will of the recommended states of mind so that their PK-conduciveness may be tested, and on this very difficult question the author does not have much to suggest. She does, however, more than once point out that seemingly remarkable PK effects are often been alleged to occur in fairly light-hearted group situations, which may create a background against which some of the desired features can develop. Having had some curious personal experiences of ostensible macro-PK myself in such contexts I am inclined to concur.

This unusual book is perhaps more likely to stir up interest than to convince readers by force of evidence that the phenomena described do indeed happen; but it could also induce some to read further and to experiment for themselves. May it be so!

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Book Review

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A Review of "Fenómenos Paranormales: Una Introducción a los Eventos Sorprendentes", by Alejandro Parra (2003)

In *Fenómenos Paranormales* Argentinean parapsychologist Alejandro Parra presents a brief introduction to parapsychology for the general public. The book has eight chapters that cover a wide range of topics and phenomena. In addition to an introductory discussion that provides definitions and historical perspective, the book covers ESP in life and lab, PK and healing, altered states of consciousness, clinical aspects of psychic phenomena, apparitions, survival of death, and miracles. In the conclusion Parra comments on criticisms of parapsychology.

"Paranormal experiences," according to Parra, "are not anomalous because they are unusual in the population, but because the hypothesis of the existence of an unmeasurable type of interaction between organisms and their environment seems to contradict the space-time energetic construct that supports the modern scientific paradigm. But we do not believe that these experiences 'violate the paradigm' of the social and natural sciences…" (p. 16). Of course, statements like this need to be qualified with the long held argument that we cannot presume to know all the laws of nature and consequently it is hard to be sure if we are dealing with actual 'contradictions' or with lack of knowledge about the workings of these phenomena.

Parra states that psi phenomena are characterized by three attributes. First, they are unusual. Second, they are intentional, although

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intentionality may be difficult to evaluate. Third, they are anomalous or difficult or impossible to "explain. . . through known physico-chemical or psychological mechanisms" (p. 22).

Not only does Parra introduce the general reader to the different experimental explorations of psi as well as to survival research and specific topics, among them ganzfeld, remote viewing, macro-PK, apparitions, and reincarnation-type cases, but he also summarizes the different ideas presented throughout the years to explain the phenomena. In the case of ESP he mentions electromagnetic radiation and elementary particles, Jung's concept of synchronicity, and Schmeidler's speculations on perceptual processing.

One of the best aspects of the book is that Parra clearly states some of the basic questions of parapsychology in an accessible way for the general public. For example, he writes: "Assuming the existence of some 'vehicles' to mediate psi information, where is the information received?; how does the brain processes the information?" (p. 62).

I was particularly interested in the chapter on clinical aspects. Parra states that many parapsychology organizations receive questions and requests for help from the public on a variety of issues, something that I have experienced myself over the years. He lists some of the typical questions the public raise, including how to fight spirits or malignant forces, finding psychics or mediums, or explanations for their personal experiences. The author argues that an individual's reaction to his experiences may bring on psychological problems. Furthermore, the way an individual is treated by others once they realize he or she is having experiences may also produce problems in the experiencer. In a survey conducted by the author and his colleague, psychologist Daniel Gómez Montanelli, they asked college students about their reactions to ESP, OBEs and many other experiences. They found the following psychological reactions to their experiences: awe (55.6%), amazement and lack of understanding (48.1%), well being (37%), fear of the unknown (33.3%), anxiety (22.2%), fear of not being understood by others (22.2%), fear of not being able to control the experience (18.5%), fear to become irrational (11.1%), anguish (11.1%), rejection of the experience (7.4%), and physical ailments (3.7%).

There is much sensible information Parra presents to guide his audience: "Many persons affirm that they are 'psychics' because they have frequent ESP or PK experiences, or because they are very intuitive. Most of these experiences are spontaneous. However, not even professional psychics are a hundred percent accurate, nor can they use their faculties at will…" (p. 55). Parra is keen to point out that ESP can be unreliable. In his words: "ESP does not keep office hours…" (p. 55). Furthermore, the author states rightly about public advertisement of ESP powers that "those who present themselves as 'infallible' in the media to deal with human problems are…swindlers and should renounce such promises" (p. 55).

A problem in some parts of the book is lack of detail, something that may be explained by the apparent need to keep the book short. Parra states that we cannot be sure if the experimental results of parapsychology can be generalized outside of the laboratory. While I agree and have discussed this issue in print, I wish the author had elaborated on the reasons for his belief.

A similar lack of detail appears in the chapters on clinical issues and on miracles. In the above mentioned survey conducted with Gómez Montanelli it was found that many respondents considered their experiences to be conflict-producing. The discussion of miracles suggests that phenomena such as Marian apparitions and bilocation cannot be explained through parapsychological processes. Unfortunately Parra does not offers details that illustrate what experiences mean when they characterize their experiences as conflict-producing nor does he offer possible demarcation criteria for the psi/miraculous dichotomy.

One hopes that a few problems may be corrected in a second edition. I do not think we can be confident in saying that the 'state of trance' is characterized by absence of alpha brainwaves or by the other attributes mentioned in the book (p. 79). To refer to the 'state of trance' as a single entity with clearly defined parameters is deceptive because the term is used to refer to a variety of inadequately mapped or understood states of consciousness representing differing degrees of consciousness alteration. Other problems include minor inaccuracies, such as referring to Charles Honorton's ganzfeld research at Princeton in the present tense, when it is well known that he died a while back after closing down his laboratory at Princeton. Similarly, it is stated that William F. Barrett founded the Society for Psychical Research and that Frederic W.H. Myers wrote his book *Human Personality and its Survival of Bodily Death* in 1885. But the SPR was founded by a group of people and Myers started preparing his classic book after the stated date.

The virtues of the book outweigh the minor problems I have listed. In addition to presenting a good overview of parapsychology, Parra is successful in discussing the difficulties and implications of the field. His book fulfills an important function in the education of the general public, particularly when it is realized that there are few books written for the Spanish reading public.

Parra states in his conclusion that there is "solid evidence in favor of ESP, [and] PK…" (p. 146). But even if parapsychologists are mistaken, the author says, the attempts to investigate the psi hypothesis are "perfectly legitimate" (p. 148). Furthermore, he states his hope that parapsychology will not be merely successful in establishing the existence of phenomena, but that it may be revolutionary in the sense of impacting on society and culture.

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