ARE ESP AND PK ASPECTS OF A UNITARY PHENOMENON? THE EFFECTS OF DECEPTION WHEN TESTING THE RELATIONSHIP BETWEEN ESP AND PK[1]

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ABSTRACT

This paper describes a second study 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), we were particularly concerned to gauge the effect upon performance of the mild deception inherent in the study design. 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 uninformed condition participants were not aware that some trials would be disguised in this way, but those in the informed condition were accurately briefed. Performance was non-significantly below chance for both ESP and PK trials, and for both true and disguised trials. There were no significant relationships between performance in the four conditions, although the effect sizes were of a similar magnitude and direction to those found previously. Participants who had been accurately briefed performed significantly worse than did those who were subject to mild deception ($Z = -2.53$, $p = 0.01$). Only one of the individual differences measures was able to significantly predict task performance, and this seems likely to have arisen as a result of multiple analyses. Reasons for participants' poor performance at the task are proposed, some of which will be considered in future research.

INTRODUCTION

The use of the umbrella term 'psi' to encompass both ESP and PK phenomena implies that they share some common features and perhaps reflect a single underlying process (see, for example, Thalbourne, in press). However, this assumption has only recently been subject to any kind of systematic test (Roe, Davey & Stevens, 2003; but see also Storm & Thalbourne, 2000). Most empirical evidence that bears on the question of whether ESP and PK are simply expressions of a unitary phenomenon is at best circumstantial (e.g. Kelly & Kanthamani, 1972; Schmeidler, 1973). At worst it reflects a lack of interest in the literature in performance patterns for ESP and more strikingly for PK performance (cf. Irwin, 1985; Schmeidler, 1994). Where patterns have been identified for one domain they may not have been studied in the other

[1] An earlier version of this paper was presented at the Parapsychological Association 46th Annual Convention, Vancouver, August 2–4, 2003.

domain, so that comparisons are limited. Nevertheless there is some suggestion that similar personality types excel at both tasks (e.g. Schmidt & Schlitz, 1989) but that ideal circumstances may be polarised for certain variables (for example, participant arousal and geomagnetic activity—Braud, 1981, 1985; Persinger, 1989). If replicated these patterns seem likely to tell us something meaningful about the nature(s) of these phenomena.

Comparisons between ESP and PK functioning are made more difficult, however, because the mode of testing for ESP is typically quite different from that for PK, and apparent differences in the preferred conditions of the phenomena may be artifacts caused by situational factors (Schmeidler, 1988). In a recent paper (Roe et al., 2003) we described a new protocol using a computer game interface that did allow both phenomena to be tested for within exactly the same context. In the game, RNG and pseudo-random data are 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 were informed that their task was simply to select one dog from among the six that they felt had performed best on that trial. They then watched a replay of the race and the result was 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. Participants were informed that their task was to attempt to influence the RNG and thus enable their greyhound to succeed. The program consisted a block of 12 races that ostensibly were all testing for ESP and a further block of 12 testing for PK. However, half of the trials that appeared to be tests of ESP in fact were of PK, and vice versa, in order to differentiate between characteristics of the phenomenon and participants' expectancies concerning that phenomenon. Despite the apparent promise of utilising an engaging game format, overall performance was at chance levels for both ESP and PK trials, and for true and disguised trials. There were no significant relationships between participants' levels of success in the four conditions. Although paranormal belief did not predict task success, some other individual differences measures, notably prior experience and state and trait anxiety, showed some promise that was consistent with previous findings (e.g. Gissurarson & Morris, 1991; Broughton & Perlstrom, 1986, 1992). We intended here to further evaluate the more promising predictors of forced-choice ESP and PK performance that might bear on an assessment of the relationship between ESP and PK. As well as measures of belief and anxiety noted above, we intended to consider prior experience, geomagnetic activity and personality, particularly the Feeling-Perceiving dimensions measured by the Myers-Briggs Type Indicator (MBTI; see Roe et al., 2003, for a more detailed rationale for the inclusion of these particular measures).

One explanation for the low overall scoring in that study reflected a concern that participants may have been aware at some level of the mild deception that was involved in some conditions. Rather than leading to depressed scoring on only those conditions, this may have given rise to a general disenchantment effect. This was not reflected in participants' comments during the debriefing discussion, but of course may not have been registered consciously. However,

when Camstra (1973) similarly manipulated the briefing given to his participants, with some being accurately told that the task involved PK while others were falsely told that it was a telepathy task, he found that those who were misinformed actually performed better than those who were accurately briefed, which would argue against a disenchantment effect.

Nevertheless, it is an important consideration in parapsychological experiments as to whether one can actually misinform or only partially inform participants in an effort to guard against expectancy effects. It is conceivable that psi is sufficiently boundless to allow participants to be aware of the experimenter's intentions and to react to these rather than to what they have been told. The present study was intended to explore the possible adverse effects of mild deception by having some participants informed that trials would be mixed within each test block while others experienced conditions similar to those pertaining previously.

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 deception (whether participants are told that they may be misinformed by the program) 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 within-subjects comparisons, while the last (deception) involved between-subjects 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. Of particular interest here, 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. 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.

A computer program was developed by PS that makes use of real-time true random versus pseudo-random data to move six greyhounds from the left to the right of the screen, simulating a race. True random data were collected using an Orion Random Number Generator, which consists of two independent analogue Zener-diode-based noise sources. Both signals are converted into random bit streams, combined (via a NAND gate) and subsequently transmitted to the computer in the form of bytes via the RS–232 port. (For more information, visit http://www.randomnumbergenerator.nl/rng/home.html.)

'Random' data for selected dogs in ESP trials were drawn from a single data file generated before the study began by taking true-random atmospheric noise data available from http://www.random.org/inform.html. 'Pseudo-random' data for non-selected race dogs in PK trials were generated using the QBASIC RND function. For both forms of pseudo-random data, the integer was converted to binary format and the ones added up to calculate by how much a dog's position should be advanced each time, so that over successive iterations some greyhounds move closer to the finish than others. The program monitors progress and notes the order in which the dogs cross the finishing line. The program continues until all six dogs have completed the course.

The participants' tasks were simply (in the ESP condition) to select a dog that they would like to own and that they thought had already done well in the pre-run race, or (in the PK condition) to have their dog identified for them by the computer and for them to 'will' it to succeed. In either case, the participants 'win' any prize-money awarded based on the dog's finishing position. Prize money is used as a simple weighted score based on finishing position (100 virtual pounds for first, £50 for second, £25 for third, no prize money for the other placings). After a series of races the participants each amass an amount of overall prize-money. 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 tests either of ESP or PK. In fact within each block half the trials are of ESP and half of PK, presented in random order. Practically, the four conditions are distinguishable as follows:–

True ESP trials: The greyhound race was run silently before the trial using pre-recorded random data.[2] The outcome was recorded on PC hard disk so that it was theoretically available to participants before they freely selected their greyhound. The race was subsequently 'replayed' on screen.

True PK trials: The race was run in real time using 'live' RNG data. Participants were allocated one of the 6 dogs using a file with data from random.org (so that there was no opportunity for them to make their own selection in a manner that could be informed by ESP).

Pseudo ESP trials: Participants apparently 'select' one of the 6 dogs as for the true ESP condition, but in fact their greyhound is chosen for them by the computer using a pseudo-random data file. Where these choices differ, the program switches the data so that the movement of the participant's chosen greyhound is determined by the data originally intended for the computer's chosen greyhound and vice versa (so that, effectively, greyhound 2 is running in lane 5 and greyhound 5 in lane 2, for example). The trial continues as for the true PK condition.

Pseudo PK trials: Again the trial is actually pre-run and outcome 'known' to the PC. Participants 'select' their dog by the timing of their space bar keypress, allowing for an interpretation in terms of Decision Augmentation Theory (DAT). Although participants believe they are watching the race in real time it is in fact a replay.

[2] Pre-recorded data are used for ESP trials rather than real-time data from the RNG, as these should be less open to any PK influence.

Participants

Forty people participated in this study, of whom 14 were males and 26 were females, with a mean age of 22.9 years ($SD = 5.2$, $Mdn = 21$). Participants were drawn from an opportunity sample and so consisted mainly of friends and colleagues and undergraduate students at University College Northampton.

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. In some cases, participants had not completed the measure (e.g. if they had questions about certain items), in which case they were given time prior to their trial to complete the form. Participants next completed the State form of Spielberger's (1983) State-Trait anxiety inventory.

They 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 label 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 as you run through the program." Participants in the informed condition were further told: "Be aware, however, that while the program appears to give you two distinct blocks of ESP and PK trials, these are in fact a little more mixed up so we can see if differences in performance are due to the task or due to expectancies about the task. Hence, while you are choosing numbers for the 'ESP block' where the races are said to have already been run, in fact half of the races will not have been run but instead will be shown in real time so that you could affect the outcome much as you can in the PK or 'owner races'. Likewise, in the 'PK block', in fact only half of the trials are being run in real time as the program suggests; the others will have been pre-run and you will have the opportunity to use ESP to select the winning dog according to the timing of your spacebar keypress." RD spent time with participants to ensure they understood the instructions and to answer any questions they might have.

All the subsequent stages of the study were administered by the computer program once it was started; altogether participants were presented with a series of 24 races in two blocks of 12. One block was labelled as 'gambler' races and ostensibly consisted of 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 preselected 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. 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

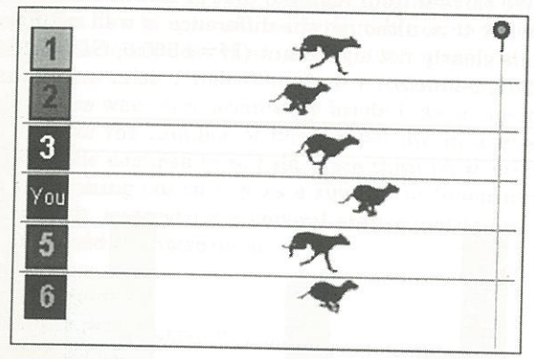

Figure 1. Screenshot of greyhound race.

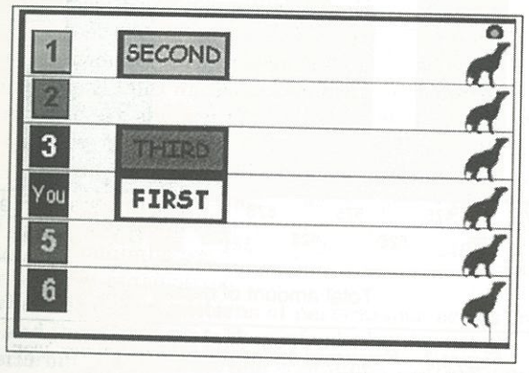

Figure 2. Screenshot of race finish.

available should assistance be required. After the program had finished RD debriefed participants, describing the nature of the four conditions within the task and, where appropriate, explaining the need to disguise certain aspects of it. Given the mild deception involved for some participants, great pains were taken to ensure that they 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. No participants asked to withdraw.

Results and Discussion

The planned outcome measure here is the finishing position of participants' greyhounds in computer races. However, to get a sense of whether overall performance was above mean chance expectation (MCE) we shall firstly consider the total amount won by each participant, since this reflects the participants' explicit objective in trying to amass as much prize money as possible.[3] The greater the success at the task the greater the amount of prize money that will have been won. If chance alone is operating then a participant will typically have won four times in the 24 trials (1/6 likelihood), and have been second and third four times respectively. This would give total prize money of £700. We can see from Figure 3 that in fact in this study the average prize money is below this, although the difference is well within one standard deviation and so is clearly not significant (M = £660.6, SD = £174.4; Wilcoxon $Z = -1.28$, $p = 0.201$, 2-tailed).

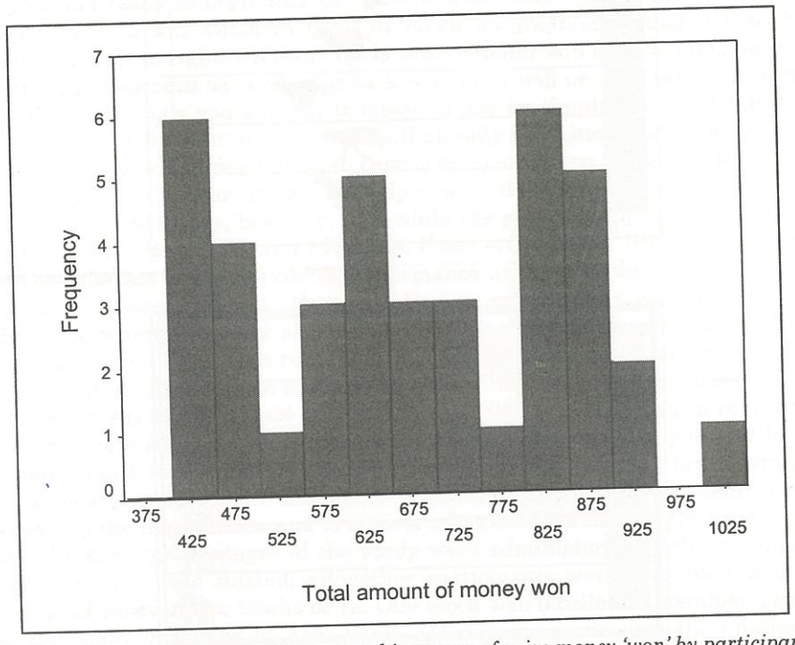

Figure 3. Frequency histogram of prize money 'won' by participants.

As previously, it was planned in advance to use sum of ranks for final finishing position as the principal outcome measure. The distribution of finishing positions for each of the four conditions is given in Table 1, and show that the frequency of finishing first or second is again below what would be

[3] Note, however, that this represents a form of goal-oriented PK in which there is unlikely to be a one-to-one mapping between the performance of the RNG (reflecting any direct 'influence') and actual performance in races or increased prize money. We consider this in more detail in the discussion.

expected by chance alone, whereas the frequency of finishing last or second last is above chance expectation. Combining the frequencies of finishing in each of the six positions weighted by that position (i.e. frequency of finishing first x 1, frequency of finishing second x 2, etc.) gives an overall sum of ranks (SOR) where higher values indicate worse performance. Here the SORs for all four conditions are above the MCE of 840, suggesting that participants are faring somewhat worse than chance expectation overall. None of these deviations is significant, however, and the effect sizes are small (all Cohen's [1988] rs are less than 0.01). There is no difference in performance across the conditions (Friedman's $\chi^2 = 4.029$, $p = 0.258$). Although participants fared slightly better in the true ESP condition compared with the true PK condition, the worst performance is with a PK condition disguised as ESP, which does not support the notion of a 'scepticism factor' in relation to PK tasks. We have therefore not been able to replicate Camstra's (1973) finding that participants in a PK study who are falsely told that they were completing an ESP task fared better than those who were accurately briefed. As in our previous study there is a tendency for the number of trials resulting in a given outcome to increase as the outcome declines from first place through to sixth. Correlating frequency against finishing position gives a significant Spearman's correlation ($rho = 0.928$, $p = 0.008$), suggesting a general shift towards lower ranks. It is not clear how this should be interpreted.

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	39	37	40	35	43	46	864	0.888	0.057
Disguised PK	40	28	39	39	44	50	889	1.833	0.118
True ESP	39	40	36	42	42	41	851	0.397	0.026
Disguised ESP	29	42	49	39	41	40	861	0.775	0.050
Total	147	147	164	155	170	177	3465		

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 none of the correlations comes close to statistical significance, indicating that performance in one condition cannot be predicted on the basis of performance in any of the other conditions. Given the relatively low power of this study we may want to consider the effect sizes themselves, and note points of similarity with study 1 in this series. As previously, positive correlations are apparent between disguised PK and true ESP, disguised ESP and true ESP, and true PK and true ESP pairs. There is again a negative

Table 2

Spearman rho Correlation Coefficients (with p values in brackets) for Comparisons of Individual Performances in the Four Conditions (N = 40)

	True ESP trials	Disguised ESP trials	True PK trials
Disguised PK trials	0.162 (0.317)	0.037 (0.822)	–0.158 (0.330)
True ESP trials		0.148 (0.361)	0.175 (0.280)
Disguised ESP trials			–0.224 (0.165)

correlation between performance at disguised PK and true PK. It is difficult to know what, if anything, to make of these, since they suggest a common outcome neither with task-type nor with perception of the task. Indeed, the strongest positive correlation—as in the previous study—is between the most disparate conditions of true ESP and true PK! This may be taken as favouring the suggestion that ESP and PK are isomorphic, but the correlation is non-significant and amounts to only 3% of shared variance.

Covariation of Performance with Condition and Participant Briefing

Previously we speculated that participants may have reacted adversely to the modest deception inherent in the design of the study, such that they were at some level aware of being deceived and this led to below-chance scoring. We directly addressed this here by having half our participants complete the study as previously, whereas half were accurately informed that in fact some of the apparent PK trials would be ESP and vice versa. The mean sum of ranks for finishing positions for each condition is given for informed and uninformed participants in Table 3.

Table 3

Mean Sums of Ranks (and Standard Deviations) for Informed and Uninformed Participants for the Four Conditions

	True ESP	Disguised ESP	True PK	Disguised PK	Overall
Informed (N = 20)	22.45 (2.63)	22.10 (3.60)	21.75 (5.05)	25.05 (9.27)	91.35 (9.02)
Uninformed (N = 20)	20.10 (4.32)	20.95 (2.70)	21.45 (3.91)	21.35 (3.91)	83.85 (8.94)
Wilcoxon Z	–2.747	–1.049	–0.041	–1.641	–2.533
p (2-tail)	0.006	0.301	0.968	0.102	0.010

Perhaps surprisingly, we find that overall performance of accurately briefed participants is significantly worse than that for participants who were not informed of the mild deception involved in the program. This difference is most marked for the True ESP condition, but is in the same direction for all four conditions.[4] This clearly suggests that whatever the reason for our failure to secure above-chance scoring, it is not a function of disenchantment on the part of participants who have experienced mild deception. Alternatively, Storm and Thalbourne (2000) have speculated that tasks that appear to participants to be 'difficult and complex' are likely to be inhibiting. It is possible that our accurate briefing just gives participants one extra thing to have to think about and presents the task as more complex than it appears to uninformed participants.

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. As with the associations we have reported previously, these correlations are modest and typically do not come close to statistical significance, so we must be wary of over-interpreting them here. However, our PK single-item measure ("I will be able to demonstrate any PK ability that I have in a controlled laboratory experiment') does significantly predict Disguised PK performance and correlates positively with True PK (and also True ESP). We should note that these associations are in the 'wrong' direction, with greater confidence predicting worse performance. This is in contrast to von Lucadou's (1987) reported positive correlation, but confirms the pattern that we have reported previously (Roe et al., 2003). A similar relationship is evident for our ESP single-item measure and for overall sheep-goat scores. Considering the subscales of the ASGS, there is no clear pattern that gives confidence either for or against a view of ESP and PK as aspects of a unitary phenomenon. Clearly, in this study prior belief is not significantly related to performance in any of the psi conditions. This is in contrast to the small but relatively consistent positive correlation between belief and ESP performance described by Lawrence (1993; mean $r = 0.029$). For PK it adds to the rather murky picture, as some authors have previously found a sheep-goat effect (e.g. Morris, Dumughn, Gentles & Grice, 1993) while others have not (see Gissurarson, 1990–91).

The strongest negative relationship in Table 4 is with prior experience, which is non-significantly associated with better performance here, but only for the true ESP task — indeed there is a suggestive trend in the opposite direction where the ESP task is hidden. This suggestion of a rather weak and variable effect is reminiscent of Palmer's (1978) review of forced-choice ESP studies, in which only 2 of 15 experiments that had considered prior experience had reported a significant relationship. Previously we found that prior experience showed a significant negative association with true PK

[4] Participants allocated to the informed and uninformed conditions did not differ significantly in terms of belief, prior experience, state or trait anxiety ($p > 0.15$ in all cases).

performance, but no such pattern is evident here, thus failing to confirm Gissurarson and Morris's (1991) most consistent PK predictor.

We should also note an interesting differentiation in the pattern of relationship between anxiety and ESP and PK performance. For ESP we see small positive correlations with state and trait anxiety, suggesting a weak tendency for those who are more anxious to go on to perform worse at the task. For PK the pattern is reversed, albeit weakly, with better performance with higher anxiety levels. This latter relationship is in contrast to our earlier finding of positive correlations between anxiety and PK performance, and also with the effects reported by Broughton and Perlstrom (1986, 1992).

Previously we reported a suggestive tendency for performance at the True ESP task to be better when geomagnetic activity is low, which was consistent with Persinger's (1989) review. For PK performance we had found that the strongest effect was with Disguised PK trials and suggested that high activity gave rise to better scoring (consistent with Nelson & Dunne, 1986) However, we were unable to replicate those patterns here; all correlations are close to zero and none approaches significance. Of course, any expectation of significance would depend upon the magnitude of effect size for these phenomena and upon

Table 4

Spearman Correlations Between Task Performance and Belief and Personality Variables (probabilities in brackets are two-tailed, N = 40)

	True ESP	Disguised ESP	True PK	Disguised PK
PK 'Criterion 1'	0.223 (0.166)	0.066 (0.687)	0.105 (0.517)	0.368 (0.019)
ESP 'Criterion 1'	0.184 (0.254)	0.173 (0.285)	0.075 (0.648)	0.209 (0.196)
Overall ASGS score	0.125 (0.442)	–0.052 (0.751)	0.056 (0.730)	0.136 (0.403)
ESP factor	0.184 (0.254)	–0.141 (0.285)	0.094 (0.564)	0.089 (0.586)
PK factor	–0.048 (0.767)	–0.048 (0.770)	0.076 (0.643)	0.173 (0.285)
Survival factor	–0.089 (0.586)	0.077 (0.638)	–0.124 (0.447)	0.025 (0.881)
Prior experience	–0.216 (0.180)	0.143 (0.379)	–0.076 (0.641)	0.073 (0.652)
State anxiety on STAIC	0.161 (0.321)	0.038 (0.816)	–0.128 (0.430)	–0.027 (0.868)
Trait anxiety on STAIC	0.262 (0.102)	0.033 0.839)	–0.081 (0.619)	–0.111 (0.495)
3-hour K index value	0.004 (0.979)	–0.024 (0.882)	0.114 (0.428)	–0.025 (0.879)

study power (particularly sample size); given typical effect sizes in other studies it may be unreasonable to expect correlations here that are sufficiently large to achieve significance. We plan to combine data across the four studies in this series to address concerns about low power.

Finally we attempted to replicate the claimed tendency for those who present as Feeling–Perceiving on MBTI measures to outperform those who present as Thinking or Judging types on GESP tasks. 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 the findings from the two ESP conditions fail to confirm previous suggestions of superior performance for FP types in ESP tasks (e.g. Honorton et al., 1990). Somewhat surprisingly, larger effects are associated with the conditions presented as PK tasks (True PK and Disguised ESP). Although none of these approaches significance, the difference between FPs and non-FPs in the True PK condition is suggestive and conforms to the pattern identified by Schmidt and Schlitz (1989). It will be interesting to see if these are confirmed in two further planned replications.

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 (N = 13)	21.77 (3.39)	22.62 (3.31)	19.92 (3.30)	22.62 (3.18)	86.92 (5.66)
Other (N = 27)	21.04 (3.91)	21.00 (3.06)	22.41 (4.77)	23.48 (8.62)	87.93 (11.15)
Wilcoxon Z	–0.624	–1.324	–1.714	–0.058	–0.072
p (2-tail)	0.549	0.197	0.089	0.955	0.955

General Discussion and Conclusion

Participants were not able in this study to score at better than chance levels. In terms of overall prize money won, participants averaged only £660 where we would expect £700 by chance alone. In terms of the sums of ranks analyses, there is no distinction between the four conditions, with overall performance being slightly below chance in all cases. This clearly can be interpreted as suggesting that there is no psi in this study. If we assume that at least under some circumstance participants are able to perform better than chance (as, for example, suggested in reviews by Palmer, 1978, for ESP, and Steinkamp, Boller & Bösch, 2002, for PK) then this poses the question as to how conditions may not have been psi-conducive here. One suggestion raised previously is that participants are sensitive to the deceptive element of the study design that was intended to differentiate between actual ESP-PK differences and differences due to participants' perceptions or scepticism concerning the task. But here we found that participants who were accurately briefed fared

significantly worse overall, which offers a strong argument against this explanation. It could be suggested that our preference for recruiting from among friends and acquaintances (though relatively few in this study are undergraduate students), so that the sample claims no history of psychic experiences and are not especially strong believers, may not be particularly conducive to success (see, for example, Parker, 2000). However, those variables that might have been used to screen participants *a priori*, such as belief and experience, again have not proved to be strong or reliable predictors of who is likely to be successful and who not, so that their use as screening aids would in this case have been ineffective and wasteful.

Given the lack of overall success, it may not be surprising to find that there is little evidence to suggest that ESP and PK performance are related to one another; but then neither were true ESP and disguised ESP nor true and disguised PK very highly correlated. Ironically, this evidence of only limited consistency in performance across conditions is one of the clearest replications of our initial study's findings. The lack of practically useful levels of reliability in psi performance continues to be a concern.

One area of possible improvement that might improve performance concerns the mechanism by which decoy greyhounds are controlled in PK trials. In this study—as previously—the target greyhound's movements were determined by the RNG, but the movements of the control greyhounds were determined using pseudo-random data already saved as data files. This raises some concerns over comparability, since it may be possible for the RNG to be influenced, but for this not to be translated into superior performance if the control dogs happen to 'run quickly' on that trial. The correlation between participants' sums of ranks and overall sampled REG output is –0.624, which is significant ($p < 0.001$) but does mean that REG output accounts for only 38.9% of the variance in combined sum of ranks scores for Disguised and True PK trials.

An alternative method that avoids such comparability problems entails 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) and this will be incorporated in future replications. One dimension that merits consideration in such a replication is participant arousal level, which is only directly measured here through scores of state-trait anxiety indices. It is generally believed that relatively low levels of autonomic arousal are ESP conducive (cf. Honorton, 1977). When Braud (1981, 1985) looked at reports of gifted PK subjects, however, many described high autonomic arousal when successful. 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). This may indicate a point of difference in processing between ESP and PK and will be a focus of future work.

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