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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.

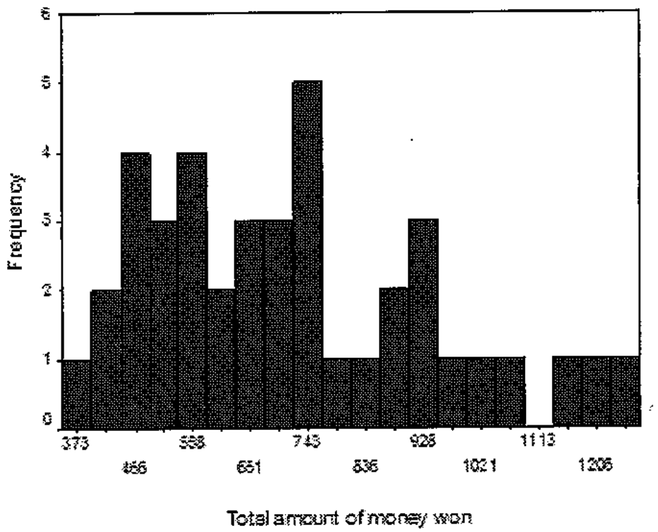

Figure 1. Frequency histogram of prize money 'won' by participants

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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