A test of reward contingent precall.

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Abstract

Precall refers to improved memory performance occurring for material practised *after* the recall test. An early model of psi suggests that such behaviour may emerge to serve the needs or motives of the individual. However, whilst this model has gained support for proposals relating to adaptive and implicit responses recent attempts have met with limited success which may reflect the incentive value or strength of the rewards offered. Hence, the current pre-registered study took the original approach of identifying from a pre-study a reward that would be considered as motivating. Identified as a cash reward of £10. The main study then examined the effect of offering a contingent £10 cash reward on precall performance. Two confirmatory predictions were made: first, that post recall practise of images will lead to greater precall of those images compared to those not practised. Second, that a contingent reward of £10 will lead to greater levels of precall compared to no reward. A repeated measures design was used with each participant randomly presented with 20 arousing images. After seeing the images participants were given a surprise recall task. Following this a random sub-set of the images was presented twice to allow them to practice. Participant's precall scores represented the number of correctly recalled images that were subsequently repeated and their baseline score represented the number of correctly recalled images that were not repeated. Analysis showed participant's precall scores were significantly higher than their baseline scores. However, the contingent reward did not have any effect on precall scores. The pattern of data may indicate a Type I error or an anomalous precognitive effect. Given this, a speculative proposal is offered in an attempt to account for the data.

Keywords: precall, precognition, contingent reward, arousing images

Introduction

Precall represents the supposed positive effect on memory recall that would occur for items that are practised *after* the recall test. Though such an idea is both provocative and controversial (see, Cardeña, 2015) there is some evidence to support this, though it is ambiguous. For instance, Bem (2011) showed (Experiment 8 and 9) that practise on a sub-set of items produced a positive effect on recall performance for those items in a *preceding* memory task. However, attempts by others to produce similar effects have met with no success (see e.g., Galak, LeBouf, Nelson, & Simmons, 2012; Ritchie, Wiseman, & French, 2012).

Based on an early model put forward by Stanford (1974) it has been suggested that psi as a process may work at an unconscious level to serve the needs or motives of the individual in an adaptive manner. The model itself contains a number of propositions which includes the notion of a psi mediated adaptive response and the idea that such effects may emerge 'without a conscious effort' (Stanford, 2015, p.96) with research showing some support for these components (Bem, Tressoldi, Rabeyron, & Duggan, 2015; Radin & Pierce, 2015). However, here the focus is on what Stanford (2015) refers to as the incentive value of the reward as he has previously suggested that the strength of a psi based effect would be 'directly and positively related to the importance' (Stanford, 1974, p. 45) of any such motivational object or event. This led to the suggestion that providing a contingent reward, which could be seen as serving the needs and/or providing motivation to the individual in question, would enhance any psi-based effects (see, Luke, Delanoy, & Sherwood, 2008). Indeed, early work suggested that the benefit of a positive experience could act as a reward, which in turn may help facilitate psi (Stanford & Associates, 1976). However, more recent work examining the impact of a contingent reward on precall type effects has been less successful (see, Luke & Morin, 2014; Luke, Roe, & Davison, 2008; Luke & Zychowicz, 2014).

Nevertheless, the lack of a clear contingent reward effect may be because the type of reward offered did not sufficiently serve the needs and/or motives of the individual (Bierman & van Ditzhuyzen, 2006). For instance, previous work has offered participants the opportunity to rate erotic images (Luke, Roe, et al., 2008) or rate the relative humour of cartoons (Luke & Zychowicz, 2014). The use of erotic images was suggested to appeal to the primal sex instinct and, though not made clear, it is possible that the use of humorous cartoons may positively influence the mood of the individual. However, it is not clear that such rewards really achieve their desired aims. For example, no assessment was made regarding participant's perceptions of such a rewards. Second, given the wide availability of erotic images, as well as humorous cartoons, and other such stimuli on the internet, it is no longer the case that access to such images is either difficult and/or would represent something unusual and therefore it is not clear that rating such images or cartoons would accurately represent a meaningful reward. As such, it is possible that providing a contingent reward may facilitate the expression of a psi-based response but the specific reward would need to be perceived as such. Hence, rather than assume that erotic images or viewing a humorous cartoon would represent an underlying need and/or motivational reward a pre-study survey was conducted on-line to specifically ask participants what type of reward would motivate them.

The on-line study was set up and delivered using Qualtrics software and a standard keyboard for entering responses. It involved asking participants to imagine themselves having the opportunity to take part in a lab based psychology experiment that would take approx. 25mins and to rank the reward options available in terms of what would most motivate them (1) to least motivate them (9). The 9 options listed, which were randomly ordered with each presentation, were:

1. Course based credits
2. The opportunity to view some erotic images

3. The opportunity to participate in another task
4. The opportunity to finish the experiment early and leave
5. A reward of £10
6. The knowledge that I've helped with a research project
7. The opportunity to view some humorous material
8. The opportunity to avoid seeing some negative images
9. A sweet reward such as chocolate or cake

A total of 29 participants took part in the on-line survey which consisted of 27 females and 2 males, with a mean age of 21years. These participants were opportunity sampled from the same population as those taking part in the main study and they were assured that all responses given in the on-line survey were confidential and anonymous.

The results can be seen below in Table 1.

Table 1 about here.

Interestingly, and perhaps unsurprisingly, the most popular option was a £10 reward (chosen by 58.6%) followed by the chance to gain course credits (27.5%). Informatively the least popular option was the opportunity to view erotic images (79.3%), though this may have been influenced by the gender distribution of the sample, which though biased in favour of females, is highly representative of a psychology undergraduate cohort. Given the findings from this survey it would seem likely that the offer of a £10 cash reward could be more of a motivator and serve the needs of the individual than the opportunity to view either erotic images or

humorous material. Hence, the current study examined the effect of a contingent £10 cash reward on precall performance. The study examined two confirmatory hypotheses:

H_A1 = Post recall practise of images will lead to greater recall of those images compared to those not practised.

H_A2 = A contingent reward of £10 will lead to greater levels of precall compared to no reward

Although both the above hypotheses make clear directional predictions two-tailed tests were used to assess the effects as this provides a more conservative approach and allows for the possibility that post-recall repletion of the images *could* impair prior recall performance (see Ritchie et al., 2012).

Method

Pre-Registration with KPU

This study was pre-registered at the Koestler Parapsychology Unit (ref#1026: http://www.koestler-parapsychology.psy.ed.ac.uk/Documents/KPU_Registry_1026.pdf) and a copy of the raw data will be uploaded to the site.

Participants

A-priori power analysis used a combined average effect size of d = 0.305 (from Bem, 2011, Experiments 8 and 9), a standard alpha criterion of 0.05 (two-tailed), coupled with a test that has the statistical power of 0.8. Using the formula from Howell (2013) where a test with the power of 0.8 as a function of significance at 0.05 (two-tailed) translates into a δ score of 2.80 which leads to a projected N of $(2.80/0.305)^2$ which gives: 9.18^2 and equals 84. However, as

there were 2 conditions (*Contingent reward* vs *No reward*) and 4 sequences of image rotations (see Appendix B) to ensure an even distribution across these permutations an opportunity sample 88 participants would be required. Hence, once this target was reached the advertisement for the study was removed and only those that had signed up between the target N being reached and the removal of the advert took part. This meant that a total of 99 participants eventually completed the study consisting of 84 (85%) female and 15 (15%) male participants with an age range of 18 to 55years (Mean: 20.1y; SD 7.1y). All participants were opportunity sampled from the undergraduate Psychology student population and all received a course credit for participating in the study. Those randomly allocated to the reward condition were also offered an additional £10 cash reward contingent on their performance.

Materials

The experiment was conducted in a psychology lab using a Super RiteMaster computer tower installed with Windows 7 enterprise and an Intel(R) Core(TM)2 Duo CPU processor with SuperLab 5.0 (Cedrus Corporation) presentation software. A diffuse star field image was used along with a 1-minute clip of new-age type music called 'Stargazing' to create a relaxation induction. The stimuli consisted of two main lists each containing 10 arousing images from the International Affective Picture Systems (IAPS) database (Lang, Bradley, & Cuthbert, 1997). One list contained positively arousing images and the other negatively arousing images. Whilst the images were matched for mean arousal level (Positive: 6.53; Negative: 6.23; t(18)1.51, p=0.149) they differed significantly in terms of valence (Positive: 7.36; Negative: 2.32; t(18)29.27, p=0.001). The 2 main lists were further divided to produce 8 sub-lists each containing 10 images (5 positive and 5 negative) with each sub-list matched for mean valence

and arousal levels (see Appendix A). To record and assess participants' belief in the paranormal/ESP the revised paranormal belief scale (Tobacyk, 2004) was also administered.

Design

Participants were randomly allocated to one of two conditions in the study (*Contingent reward* vs. *No reward*). To reduce the opportunity of possible bias in allocating participants to a condition an experimental management system (Sona Systems see: htt ps://canterburyccu.sona-systems.com/Default.aspx?ReturnUrl=%2f) was used so that participants signed themselves up for the study and picked a timeslot that suited them. Hence, neither the Research Assistant (RA) nor the Primary Investigator (PI) were involved in enrolling participants. Furthermore, the PI also created a list of participants to ensure an even distribution across the two conditions (*Contingent reward* vs. *No reward*) and stimulus list rotations, with equal numbers of participants viewing each type of stimulus rotation (see Appendix B) from 1 to 99. The PI randomly allocated participants to this list in blocks of 16 using a random number generator (see, https://www.random.org/) to identify where in the block the first participant would be placed. For example, in the first block participant 1 was placed in position 13 which refers to the 3rd practise list in the no contingent reward condition (Study 4_Expt_P3). The second participant was then entered into position 14, which consisted of practise list 3 (P3) *with* a contingent reward (CR). This continued and when position 16 was filled the allocation rotated around to the first position until all positions in that block were filled. For example, if participant 4 was entered into position 16 participant 5 would be entered into position 1. For the second block of 16 the random number generator was again used to identify where in the block the first participant (in this instance participant 17) would be entered. This procedure

continued until all participants had been allocated a condition. The RA will then ran the participants in this sequence as they signed themselves up for the study.

Procedure

Consistent with previous work all participants were made aware that the experiment tested for ESP, although precisely how was not explained until they had completed the experiment. Each participant was tested individually in a quiet room. They began by reading through a general information sheet and completing a consent form. For those allocated to the contingent reward condition the instruction sheet had a £10 note clipped to it and informed them that if their ESP score was above chance they would immediately win the £10. No mention of the cash reward was made to those in the non-contingent condition. After having read the information sheet participants completed a paper version of the Revised Paranormal Belief Scale (Tobacyk, 2004). All participants then faced a computer screen with the instructions 'When you are ready to begin press any key'. Once they pressed a key on the keyboard they were told that they would be presented with an image of stars and hear some music and that the aim of this is to help them relax. Once again, they pressed a key to continue on to the image of a starfield along with the relaxing new-age type music, which played for 1 minute. At the end of this another instruction screen appeared with the following message: 'You will now be presented with a selection of both positive and negative images. Each image will remain on screen for 3.5 seconds. Please attend to the images'. The instructions ended by stating that participants should 'Press any key' to begin. Once a key was pressed the computer presented all 20 arousing images in a random sequence. Each image was shown on screen for 3500ms along with its identifying label in font Ariel size 36pt. Once all images had been shown a surprise recall instruction screen appeared saying 'Your task now is to recall as many of the images you have just seen and write

their names down on the sheet provided. You have 3 minutes to do this. You can write them in any order and spelling doesn't matter'. Those allocated to the *Contingent reward* condition were also told that 'If their ESP performance was above chance they would immediately win the £10 cash reward'. Participants were then given 3 minutes to complete this section of the task. At the end of the 3 minutes the computer sound a tone and instructed the participant to stop writing and hand their response sheet to the experimenter. During the experiment each participant's precall score was calculated by the experimenter as the number of images that would be repeated that were recalled compared to the number of images that were not repeated. For those in the *Contingent reward* condition if their recall of the repeated images was higher than those not repeated the participant would win the cash reward. If the precall score was either the same as or lower than the score for non-repeated images they would not win the reward. After handing the recall response sheet to the RA for coding participants looked back at the computer screen for the next set of instructions telling them that they would now see a subset of images from the list just seen and that each image would remain on screen for 3.5 seconds and they should attend to the images. Participants simply pressed a key to move through this stage during which a practise list of 10 images (5 positive and 5 negative) was presented one at a time as before. After this participants were asked to recall the 10 images just seen by writing down their names on the sheet provided and handing it to the experimenter. They were given 2 minutes to do this and at the end of this time the computer sounded a prompt and instructed them to stop writing and hand their response sheet to the experimenter. The same 10 images were then shown again followed by another recall test. Once the post-recall practise phase has been completed all participants were asked to complete two 5-point Likert scale questions asking them how motivated they were to complete the task (e.g., 1=strongly motivated; 5=strongly unmotivated) and how pleasant they found the task overall (e.g., 1=very pleasant; 5=very unpleasant). Finally, participants were given a debrief information sheet

explaining the aims of the study and providing contact details of the Principal Investigator (PI) should they wish to obtain more information. It should be noted that all those in the *Contingent reward* condition who won the reward were immediately given this and signed a receipt.

Ethics

Full University Faculty ethics approval was obtained for this study (Ref: 16/SAS/313C).

Results

Ninety-nine participants were each exposed to 20 images, creating a total of 1980 trials. Of these, there were 162 (8.1%) trials that required additional consideration by two coders blind to the aims of the study due to spelling and/or grammar issues. The two coders who examined these items agreed 100% on the outcome of 161 (99.4%) of the responses. The 1 (0.6%) trial where no agreement was reached was excluded from the analysis. There were also 21 (1.0%) intrusions which did not refer to any of the images seen but were invariably semantically related (e.g., climber, death, snow) and these were also excluded from the analysis. Furthermore, repetitions were not counted as intrusions, just ignored, as the primary focus was whether 'the participant recalled the image' not necessarily the correct word.

Recall accuracy was coded as the number of images correctly recalled out of 20. The *Precall* score represents the number of correctly recalled images (from a total of 10) that were subsequently repeated and the *Baseline* score represent the number of correctly recalled images that were not repeated. The *Precall* and *Baseline* scores for the positive and negatively valenced images can be seen in Table 2.

Table 2 about here.

The first confirmatory hypothesis tested whether participant's *Precall* score would be greater than their *Baseline* score. A repeated measures t test comparing *Precall* to *Baseline* scores showed that the level of accuracy for the *Precall* condition was significantly higher than the *Baseline* condition (respective means: 5.77 vs. 5.24), t(98)=2.352, p=0.021, 95% CI (0.0836, 0.987), *d*=0.32. The second confirmatory hypothesis tested whether participant's *Precall* score would be greater in the *Contingent reward* condition compared to the *No reward* condition. An independent samples t test showed no difference in precall between the two conditions, (respective means: 5.68 vs. 5.87), t(97)=0.562, p=0.575, 95% CI (-0.499, 0.894), *d*=0.11.

Exploratory analysis initially examined whether there was a correlation between *Precall* and *Baseline* scores, however this was not significant, r(99)=0.075, p=0.460. Following this post-hoc comparisons (utilising a Bonferroni correction) were made between the positive and negative images in both the *Precall* and *Baseline* conditions. For the *Precall* condition this showed that participants precalled more negative images compared to positive images (respective means: 3.42 vs. 2.35), t(98)=7.304, p=0.001, 95% CI (0.779, 1.361), *d*=0.47. The same pattern was evident in the *Baseline* condition with participants recalling more negative images compared to positive images (respective means: 3.12 vs. 2.13), t(98)=6.947, p=0.001, 95% CI (0.707, 1.272), *d*=0.47.

Comparisons of mean motivation levels and pleasantness ratings between the *Reward* and *No reward* conditions showed no significant differences (see Table 3, all ps >0.14).

Table 3 about here.

Finally, examination of possible associations between *Precall* performance and participant belief in paranormal were conducted, see Table 4. These correlations showed a positive, though not consistent, relationship between precall scores and psi, witchcraft, spiritualism and belief in extraordinary life forms. Interestingly, there was no relationship between precall scores and belief in precognition.

Table 4 about here.

Discussion

Data show a clear anomalous effect with participants recalling more of the images that *will be* repeated in the future. However, offering a contingent cash reward of £10 did not influence precall scores. There was no clear association between precall scores and baseline recall scores, although in both conditions participants recalled more negative images compared to positive images. There was no difference in mean reported motivation level or pleasantness ratings between those offered a reward and those not offered a reward. Finally, there was some evidence of a positive relationship between belief in the paranormal and precall performance.

That an anomalous precall effect was evident in the data could be interpreted simply as a Type I error. It is important to recognise that science does not deal in certainties but relies on statistics to make inferences about the state of the world. When doing this there are two possibilities: that there is in reality no effect in the population and the result is simply noise in the data, or a Type I error, or that there is in reality an effect in the population (Field, 2013). It is not possible to know with certainty which of these two options is true. Only with on-going research and replicated and consistent effects over time and with multiple samples does the

level of trust in such findings improve. Hence, the findings reported here should be viewed as providing one piece of the puzzle in helping to understanding the possible nature of such anomalous effects.

The anomalous precall effect is however consistent with the positive findings of others who have also reported anomalous precognitive effects (Bem, 2011; Maier et al., 2014; Subbotsky, 2013; Vernon, 2015). Such findings are suggestive that something out of the ordinary is going on and that it may be possible for a future event to influence a present event and/or behaviour. Interestingly, the lack of any association between precall and baseline recall scores suggests that the two processes may be mediated by distinct underlying neural processes. However, it should be noted that this is a speculative possibility and in this instance is reliant on a null result and as such remains the domain of future research to explore. Furthermore, it is conceptually interesting to note that the current study elicited an effect using what Bem et al. (2015) refer to as a 'slow-thinking protocol' which they suggest may exhibit a 'lower success rate' (p.8) compared to fast-thinking protocols. However, the success of the current paradigm may be due to the length of time given to initially recall the target material. Here, participants were given 3 minutes to recall as many of the images as they could in any order. Whilst others have either failed to clearly specify an amount of time (e.g., Baruss & Rabier, 2014; Bem, 2011), or allowed participants up to 5 minutes (e.g., Ritchie et al., 2012; Subbotsky, 2013). It could be that allowing participants more time increases the possibility of unhelpful conscious cognitive processes interfering and/or inhibiting psi based effects. Such an idea would fit with the findings from Bem et al. (2015) suggesting more robust precognitive effects may be elicited with what they consider to be fast-thinking protocols. However, this raises the point that the distinction between fast and slow is somewhat arbitrary and is confounded with implicit and explicit processes. As such, this may be something that future research could helpfully tease apart. Alternatively, it could be due to the fact that the current study utilised

emotive images whereas the much of the previous research that failed to elicit a clear effect is based on the recall of words (e.g., Baruss & Rabier, 2014; Ritchie et al., 2012; Subbotsky, 2013).

The fact that both precall and baseline scores were better for negative images compared to positive images is consistent with both mainstream literature (see e.g., Kensinger, 2007) and psi based research (Lobach, 2009). A suggestion put forward to account for such a pattern is that stimuli that elicit stronger feelings and/or reactions may be better suited to eliciting psi based behaviours (e.g., Radin, 2004). Hence, future research may find it more productive to include or rely on stimuli that produce strong physiological reactions.

The significant precall effect reported here also raises some further issues. First, is the issue of whether the precall effect is reliant on feedback or not. Second, given that a reward did not influence precall performance it could be suggested that offering a reward does not help to elicit psi type behaviours. Finally, some consideration is given to how such an effect may be accounted for theoretically.

There is discussion in the general precognitive literature that feedback concerning the relevant target material may be important for precognition to occur (Marwaha & May, 2016). The idea here is that the precall effect could be based on the feedback provided post testing rather than the future event itself. There is some support in the literature for the notion that providing feedback can help with precognitive performance (Honorton & Ferrari, 1989; Steinkamp, Milton, & Morris, 1998). However, in the current study no specific feedback regarding precall performance was given to the participants either during or after the study. Whilst it was the case that those in the contingent reward condition would have received a reward following their performance, if it was above chance, they would not know to what extent this was reliant on recalling any of the specific target images. Hence, such feedback could at best be viewed as generic and given that the contingent reward did not influence

performance would seem to suggest that feedback, in this instance, is not essential for precall to occur. Such a finding, whilst useful in helping to delineate the potential processes underlying precall performance, is not unique as others have also found clear precall effects without including a feedback component (see Bem, 2011).

In terms of contingent reward there are anecdotal reports of rewards leading to more robust psi effects (Franklin & Schooler, 2011; Targ, 2012), though others have maintained that a more intrinsic level of motivation is more effective (Haraldsson, 1970). Furthermore, the model put forward by Stanford (1974) has been taken to suggest that psi based behaviours would be directly influenced by the relative importance, or reward to the individual. However, in this instance offering a £10 cash reward had no effect. Such a pattern suggests a number of plausible possibilities. First, and most obvious, is the idea that offering a contingent based reward does not influence the strength of any psi based effects. Such an idea would be consistent with the findings of others who have found that offering a reward has no impact on psi performance (see, Luke, Roe & Davison, 2008; Luke & Morin, 2014; Luke & Zychowicz, 2014). A second possibility is that offering a reward could in fact reduce the level of intrinsic motivation of the individual, which in turn may reduce and/or inhibit the emergence of any psi type behaviours. Such an idea would be consistent with mainstream research showing that external rewards can indeed reduce intrinsic motivation (Deci, Koestner, & Ryan, 1999). However, if this were the case then one may expect to see reduced levels of motivation for those offered a reward compared to those not offered any reward. As can be seen from the data presented in Table 3 this is clearly not the case. However, it should be noted that participant motivation in this instance was only assessed using a single item question. Albeit that participant's completed this anonymously it is possible that they may have not fully understood the question and/or that the question did not provide a full and accurate measure of their motivation. As such, the idea that the reward had no influence on motivation is speculative and

needs to be interpreted with caution. Nevertheless, this could be something that future research can address directly using a standardised motivation scale such as the Situational Motivation Scale (Guay, Vallerand, & Blanchard, 2000). A further plausible though speculative alternative is that the participants in the study may not have believed that the reward was real. This possibility came to light during the debriefing process when some participants spontaneously mentioned that they thought the reward may have been part of a deception. Familiarity with lab based research makes it all too easy to forget how those who are naïve or simply inexperienced may view such procedures and what they do, or do not believe is the real focus of the study. Unfortunately, participants were not asked whether they thought the reward was real or not, however, it is possible that some, at least, may not have believed in the reward and hence it may not have motivated them. Such an idea highlights the necessity for a deliberate effort to be made as part of the debriefing procedure to invite such disclosures from participants regarding their concerns about the study which would include any suspicions. Effective use of the post-experimental interview represents a key opportunity to help improve future work (see, Aronson, Ellsworth, Carlsmith, & Gonzales, 1989).

Theoretically, from a physics perspective, as counterintuitive as it may seem, all fundamental questions in physics are time symmetric. That is, they admit and allow both time-forward and time-reverse formulations (Sheehan & Ibison, 2011). Hence, precognition is both allowed and possible. Intriguingly, Taylor (2014) has suggested that the notion of precall or precognition would be consistent with a block universe account which suggests that information transfer may be influenced by the phase synchrony of the brain states at the two times. That is, a resonance may occur between the spatiotemporal neuronal network that encodes the original stimuli and the one that is used to recall it at a later date. The assumption is that this is overlap, or match, in neural network patterns leads to a greater coherence which in turn could produce a greater activation of the original network leading to a greater level of

recall. The greater level of resonance between the neural network of the present and the future is proposed as the basis for improved recall in the here and now. In essence, the information is transferred from the future brain to the present brain of the same person. Such a proposal is necessarily speculative given our current understanding of such phenomena and the nature of the time in general. However, it is interesting to note that recent research examining the neural connectivity of parent-child dyads has shown associations between the level of neural connectivity and complex emotions of both parent and child (Lee, Miernicki, & Telaer, 2017). Furthermore, whilst the proposal that neural phase synchrony over time may mediate precall effects is necessarily speculative it does at least offer a potential mechanism that can be tested.

Finally, that there was some evidence of a positive association between belief in ESP and precall performance is interesting but not new (Palmer, 1971). What was of interest here was that the pattern was not consistent across the various domains as measured by the RPBS (Tobacyk, 2004), and in particular that there was no association between belief in precognition and precall performance. This would suggest that, if belief is in any way driving the effect, that it is based more on an overall generic belief rather than a specific belief in a particular aspect of ESP.

In conclusion, this study shows evidence of an anomalous precall effect that may be either a Type I error or a 'real' anomalous effect. If real, then it does not seem to be reliant on feedback concerning target material and may be mediated by processes distinct from those supporting normal recall. That the offer of a contingent reward did not influence precall performance could be taken to suggest that such rewards do not influence psi based behaviours. However, before such a view could be accepted it would need to be made clear that the reward was real. Furthermore, the precall effect could be accounted for in terms of resonant neural synchrony occurring at the two time periods. Finally, the association between belief in ESP

and precall performance suggests that generic belief in ESP events/behaviours may be sufficient.

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Appendix A

Showing the 20 images (10 positive and 10 negative) from the IAPS database used in the main study with identifying names, IAP reference numbers, valence and arousal ratings.

Positive Image	**IAP#**	**Valence**	**Arousal**	**Negative Image**	**IAP#**	**Valence**	**Arousal**
Astronaut	5470	7.35	6.02	War	2683	2.62	6.21
Hiker	5629	7.03	6.55	Gun	2811	2.17	6.9
Skier	8030	7.33	7.35	Grave	3005.1	1.63	6.2
Sailing	8080	7.73	6.65	Suicide	6570	2.19	6.24
HangGlider	8161	6.71	6.09	Solider	9160	2.81	6.04
Skydivers	8185	7.57	7.27	Toilet	9301	2.26	5.28
Pilot	8300	7.02	6.14	Police	6834	2.91	6.28
Gymnast	8470	7.74	6.14	Ship	9600	2.48	6.46
RollerCoaster	8490	7.2	6.68	Accident	9910	2.06	6.2
Money	8501	7.91	6.44	Fire	9921	2.04	6.52
	Mean	7.36	6.53		**Mean**	2.32	6.23

Appendix B

The 8 sub-lists (consisting of 4 practise lists and 4 no-practise baseline lists) created from the original list of 20 images with valence and arousal ratings.

Practice 1	**Valence**	**Arousal**	**No practice baseline**	**Valence**	**Arousal**
War	2.62	6.21	Skydivers	7.57	7.27
Gun	2.17	6.9	Pilot	7.02	6.14
Grave	1.63	6.2	Gymnast	7.74	6.14
Suicide	2.19	6.24	RollerCoaster	7.2	6.68
Solider	2.81	6.04	Money	7.91	6.44
Astronaut	7.35	6.02	Toilet	2.26	5.28
Hiker	7.03	6.55	Police	2.91	6.28
Skier	7.33	7.35	Ship	2.48	6.46
Sailing	7.73	6.65	Accident	2.06	6.2
HangGlider	6.71	6.09	Fire	2.04	6.52
Mean	4.76	6.43	**Mean**	4.92	6.34

Practice 2	**Valence**	**Arousal**	**No practice baseline**	**Valence**	**Arousal**
Skydivers	7.57	7.27	War	2.62	6.21
Pilot	7.02	6.14	Gun	2.17	6.9
Gymnast	7.74	6.14	Grave	1.63	6.2
RollerCoaster	7.2	6.68	Suicide	2.19	6.24
Money	7.91	6.44	Solider	2.81	6.04
Toilet	2.26	5.28	Astronaut	7.35	6.02
Police	2.91	6.28	Hiker	7.03	6.55
Ship	2.48	6.46	Skier	7.33	7.35
Accident	2.06	6.2	Sailing	7.73	6.65
Fire	2.04	6.52	HangGlider	6.71	6.09
Mean	4.92	6.34	**Mean**	4.76	6.43

Practice 3	Valence	Arousal	No practice baseline	Valence	Arousal
Sailing	7.73	6.65	Hiker	7.03	6.55
HangGlider	6.71	6.09	Skier	7.33	7.35
Skydivers	7.57	7.27	Astronaut	7.35	6.02
Pilot	7.02	6.14	RollerCoaster	7.2	6.68
Gymnast	7.74	6.14	Money	7.91	6.44
Suicide	2.19	6.24	Gun	2.17	6.9
Solider	2.81	6.04	Grave	1.63	6.2
Toilet	2.26	5.28	War	2.62	6.21
Police	2.91	6.28	Accident	2.06	6.2
Ship	2.48	6.46	Fire	2.04	6.52
Mean	4.94	6.26	**Mean**	4.73	6.51

Practice 4	Valence	Arousal	No practice baseline	Valence	Arousal
Astronaut	7.35	6.02	Pilot	7.02	6.14
Hiker	7.03	6.55	Gymnast	7.74	6.14
Skier	7.33	7.35	Sailing	7.73	6.65
RollerCoaster	7.2	6.68	HangGlider	6.71	6.09
Money	7.91	6.44	Skydivers	7.57	7.27
War	2.62	6.21	Suicide	2.19	6.24
Gun	2.17	6.9	Solider	2.81	6.04
Grave	1.63	6.2	Toilet	2.26	5.28
Accident	2.06	6.2	Police	2.91	6.28
Fire	2.04	6.52	Ship	2.48	6.46
Mean	4.73	6.51	**Mean**	4.94	6.26

Table 1. Showing the percentage of people choosing each of the nine options.

Choice	Credits	Erotic images	Another task	Leave early	£10 reward	Helping out	Humorous material	Avoid negative	Chocolate / cake
1st	27.59	0.00	0.00	0.00	58.62	10.34	0.00	0.00	3.45
2nd	44.83	0.00	3.45	0.00	27.59	3.45	0.00	0.00	20.69
3rd	20.69	0.00	3.45	6.90	3.45	37.93	3.45	0.00	24.14
4th	3.45	3.45	20.69	10.34	3.45	20.69	31.03	0.00	6.90
5th	0.00	0.00	31.03	3.45	3.45	17.24	34.48	3.45	6.90
6th	3.45	6.90	3.45	41.38	0.00	6.90	17.24	13.79	6.90
7th	0.00	6.90	27.59	20.69	3.45	0.00	6.90	20.69	13.79
8th	0.00	3.45	3.45	13.79	0.00	3.45	6.90	55.17	13.79
9th	0.00	79.31	6.90	3.45	0.00	0.00	0.00	6.90	3.45

Table 2. Showing mean (and standard deviation) *Precall* and *Baseline* scores for the positive images, negative images and for all images combined.

	Positive		**Negative**		**Total**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Precall	2.35	1.19	3.42	1.06	5.77	1.74
Baseline	2.13	0.99	3.12	1.11	5.24	1.58

Table 3. Showing mean (and standard deviation) levels of reported motivation (on a scale of 1=strongly motivated to 5 strongly unmotivated) and pleasantness (on a scale of 1=very pleasant to 5 very unpleasant) for both the *Reward* and the *No reward* conditions.

	Contingent Reward		**No Reward**	
	Mean	**SD**	**Mean**	**SD**
How motivated	1.62	0.87	1.87	0.85
How pleasant	2.58	1.41	2.87	1.25

Table 4. Showing correlation coefficients (with significance values) between total precall score and the seven sub-scales of the RPBS

	correlation	significance
Traditional Religious Belief	.060	.55
Psi	.186	.06
Witchcraft	.214	.03*
Superstition	.056	.58
Spiritualism	.205	.04*
Extraordinary Life Form	.229	.02*
Precognition	.127	.21

**Sig at 0.05 (two-tailed)*