Attempting to elicit a precall effect using emotive images and participants with high levels of belief in psi.

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Abstract

Precall refers to the explicit recall of target material, such as words or images, which incorporates the unusual notion that practice sessions occurring *after* the recall test will influence previous recall performance. A recent attempt to elicit such an effect using arousing images was unsuccessful. However, it was noted that the failure to elicit a precall effect may have been the result of relying on images that were not sufficiently arousing and that the participants completing the task had lower than average levels of belief in psi. Hence, the current study addressed these points by utilising both positive and negative images that were rated as more arousing and by selectively recruiting participants with high levels of belief in psi. The prediction was that post-recall practise would lead to greater *precall* of those items practised compared to items not practised. The deign utilised an on-line precall study to present the emotive images and was completed by 107 participants with high levels of belief in psi. Comparison of recall accuracy between images that were subsequently repeated and those that were not showed no evidence of a precall effect. Nevertheless, post recall practise did improve recall performance. The failure to find any evidence of a precall effect is consistent with the claims and findings of others who take a more sceptical approach to psi based effects. Nevertheless, reflection on the methodology of the current experiment offers some speculative possibilities as to why no precall effect was elicited.

Introduction

The idea that current behaviour and/or cognition could be influenced by some unknown *future* event is encapsulated within the notion of precognition. Precognition is generally taken to refer to the ability to obtain information about a future event, or predict a future event, using information that is obtained via a non-usual route, prior to the occurrence of the event itself (see e.g., Bierman & Bijl, 2014; Franklin, Baumgart, & Schooler, 2014; Honorton & Ferrari, 1989; Marwaha & May, 2016). Despite, or perhaps because of, the unusual nature of this alleged effect there is a long history of research attempting to elicit such effects and clarify their nature and process (see e.g., Franklin et al., 2014).

Experimentally such precognitive effects have manifested themselves in a variety of ways. For instance as *unexplained anticipation*, where an individual may be able to anticipate correctly at above chance levels something that is about to occur (e.g., Haraldsson, 1970; Schmidt, 1969). As well as *precognitive priming,* where behaviour can be influenced by primes that are shown *after* the target stimulus has been seen (e.g., Bem, 2011; Vernon, 2015). There is also research looking at *presentiment,* which refers to specific physiological changes that can occur in the human nervous system prior to the exposure of a stimulus. Such changes can occur in the brain, heart rate, skin conductance, or GSR (e.g., Bierman & Radin, 1997; Bierman & Scholte, 2002; Radin, 2004). Finally, there is *precall,* which refers to the explicit recall of target material, such as words or images, with the idea that practice sessions occurring *after* the recall test will influence the previous recall task. Hence the term precall (see, Bem, 2011; Subbotsky, 2013; Vernon, In Press). The focus here is on the latter of these processes, precall. However, it should be noted that current understanding does not make it possible to identify whether these various manifestations of precognition represent distinct cognitive/behavioural processes or whether they merely represent different aspects of the same underlying processes. Furthermore, it is not clear whether such effects are manifested in the individuals participating in such research or simply reflected in the nature of time itself (see e.g., Taylor, 2014).

However, whilst the evidence for such precognitive effects is intriguing it also remains inconsistent. For instance, researchers attempting to replicate and/or extend such work have failed to elicit any precognitive effects (see e.g., Galak, LeBouf, Nelson, & Simmons, 2012; Ritchie, Wiseman, & French, 2012). While a number of meta-analyses have shown small but reliable effects (Bem, Tressoldi, Rabeyron, & Duggan, 2015; Honorton & Ferrari, 1989; Steinkamp, Milton, & Morris, 1998; Storm, Tressoldi, & Di Risio, 2012; Utts, 1991). Such

inconsistencies led Franklin et al. (2014) to call for more research exploring this area in an effort to shed light on the possible processes involved and help clarify the different outcomes.

With this call in mind a precall study was conducted on-line using emotive images, as these had been suggested to be more effective at eliciting precognitive effects (Radin, 2004). The study was completed by 94 participants but failed to show any evidence of a precall effect (see, Vernon, In Press). Such a null result could of course simply reflect the notion that precall is impossible and that any effects are simply the result of Type I errors or poor statistical analysis (see, Wagenmakers, Wetzels, Borsboom, & van der Maas, 2011). However, others have argued that even when utilising alternative statistical approaches there is still evidence of such precall effects (Rouder & Morey, 2011). As such, the lack of a precall effect demonstrated by Vernon (In Press) was discussed in terms of potential methodological limitations such as the failure to include a relaxation induction process, the low arousal levels of the images used and the possible scepticism of the participants based on their low scores using the Revised Paranormal Belief Scale (RPBS; see, Tobacyk, 2004).

In terms of relaxation, early research by Braud (1974) suggested that relaxed participants may be better able to elicit psi based phenomena (see also, Honorton, 1977). Such an idea gains some support from the research by Bem (2011) which elicited reasonably robust precall effects whilst incorporating a relaxation induction as part of the procedure. This relaxation induction involved presenting participants with an image of a star field whilst simultaneously playing new-age type music. As such, the current study worked to incorporate a relaxation induction phase similar to that reported by Bem (2011).

Whilst the images used by Vernon (In Press) were taken from the IAPS database and classified as either positive or negatively arousing it is possible that the level of valence and/or arousal of these images may not have been sufficiently emotive. For instance, Maier et al. (2014) in their study on precognition used images from the IAPS with a positive valence of 7.57 and negative valence of 1.73 compared to the images used by Vernon (In Press) which had a positive valence of 7.19 and a negative valence of 3.52. Interestingly Maier et al (2014) found a precognitive effect for the negative images but not for the positive images. Given this, it may be that using more emotive images would be more effective at eliciting a potential precall effect. Such a possibility would be consistent with suggestions that the more emotive the stimulus the more likely a psi effect will emerge (see e.g., Lobach, 2009; Radin, 2004).

Finally, Vernon (In Press) utilised an opportunity sampling method to recruit participants which may have resulted in the recruitment of individuals with either a low level of belief in psi and/or a high level of scepticism. For instance, the mean overall score on the RPBS for those completing Vernon's (In Press) precall task was 77.6 which is slightly lower than the reported norm of 89.1 by Tobacyk (2004). Hence, it is possible that by relying on an opportunity sampling method the study contained individuals with a more sceptical frame of mind, which in turn may have reduced any possible precall effects. Such a possibility is consistent with the research showing that belief can be an important predictor of success in psi experiments (see e.g., Palmer, 1971). Where an individual's belief level can be used to classify them as either sheep (i.e., believers) or goats (i.e., non-believers) with research showing that those with a higher belief in the paranormal tend to score above chance whereas those with a lower level of belief score either at chance or below it (see e.g., Parker, 2000).

As such, the current study attempts a conceptual replication of Vernon's (In Press) on-line precall study but with a modified method which includes a relaxation induction phase, the use of more emotive images and specifically targets recruitment at a population that would be expected to exhibit higher levels of belief in psi. The pre-registered confirmatory prediction was that in the test phase participants will recall more of the images that appear in the later post-test practise phase compared to those that do not.

Method

Pre-Registration with KPU

This study was pre-registered with the Koestler Parapsychology Unit (ref#1025: http://www.koestler-parapsychology.psy.ed.ac.uk/Documents/KPU_Registry_1025.pdf) and a copy of the raw data uploaded to the site.

Participants

The study was halted once 213 participants had been recorded as attempting the task. This was based on a-priori power analysis showing that an N of 90 would be required (see KPU ref#1025) and that all participants would need to complete all aspects of the task, fully attend throughout and have a mean Revised Paranormal Belief full scale of >89.1 (Tobacyk, 2004). Of the original 213 participants that begun the study 35 (16.4%) failed to complete all aspects

of the study. A further 18 (8.4%) were removed for admitting to being distracted in some way during the study and 53 (24.8%) were eliminated for having RPBS sum of items scores of <89.1. This left 107 participants of which 54 were male and 53 female, with ages ranging from 19 to 81 (mean 46.7, SD 13.74). These participants were opportunity sampled via an advertised web-link to students attending the College of Psychic Studies in London[1].

Materials

The experiment utilised Qualtrics software (www.qualtrics.com) to build and present the study on line. This included a revised paranormal belief scale to assess participants' belief in anomalous events and classify them as either *high-believers* or *low-believers*. This classification was based on the mean scores reported by Tobacyk (2004), see Table 1 below. The study also utilised an image of a diffuse star field along with a 3-minute clip of new-age type music called 'Stargazing' to create the relaxation induction. A relaxation manipulation check was also created to assess how relaxed [if at all] participants would be following the relaxation induction. This was a 10 point Likert-type scale which required participants to rate on a scale from 1 (completely tense) to 10 (completely relaxed) how relaxed they felt at that moment in time. The precall stimuli consisted of two main lists (see Appendix A) 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. The images were matched for mean arousal level (Positive: 6.53; Negative: 6.23; t(18)1.51, p=0.149) but differed significantly in terms of valence (Positive: 7.36; Negative: 2.32; t(18)29.27, p=0.001). Importantly, the positive images used in the current study were significantly *more* arousing than those used in a previous study (see, Vernon, In Press) with the current Positive images showing a mean of 6.53 whereas previous Positive images had a mean of 5.86; t(22)2.65, p=0.05. Furthermore, the negative images used in the current study were both significantly more negative than those used in the previous study (Current Negative: 2.31; Previous Negative: 3.52; t(22)4.75, p=0.001), and significantly more arousing(Current Negative: 6.23; Previous Negative: 5.78; t(22)2.23, p=0.05). These 2 main lists were further divided to produce 4 sub-lists each containing 20 images (10 precall and 10 baseline) consisting of 10 positive and 10 negative images, with each

[1] Special thanks to staff of the College of Psychic Studies for their generous help in allowing me access to their student cohort.

sub-list matched for mean valence and arousal levels (see Appendix B) with the images in each of the sub-lists rotated so as to ensure that each image appeared in each condition an equal number of times. An attendance/distraction check question was also created which asked participants whether they had 'left the computer at any time during the study, or switched to another application/window, checked email etc', it also prompted them to 'please be honest as it is essential that I know whether you were distracted during the task or not'. Participants responded to this question by typing their answer(s) into a text box.

Table 1 about here

Design

The experiment consisted of six phases: an *information capture phase* followed by a *relaxation induction phase* then an *image presentation phase* followed by a *recall phase*, a *post-recall practice phase* and finally a *check phase,* (illustrated in Figure 1). In the information capture phase participants read through an introduction to the study, provided informed consent, demographic information and completed the paranormal belief scale. In the relaxation induction phase they were presented with a star field image on screen, cropped to 700px wide and 525px high, along with a 3-minute clip of new-age type music. This was followed by the image presentation phase during which they were presented with all 20 arousing images in a random order. Following this they completed a surprise precall/recall task. Once this had been completed participants were then randomly presented with one of the 4 'Practice' lists (with each list containing 5 positive and 5 negative images, see Appendix B) matched for valence and arousal levels with the images not repeated. The Qualtrics software was used to randomly select the relevant sub-list using an inbuilt pseudorandom number generator (PSNG) with the proviso that the PRNG evenly select the four practice lists. Participants were exposed to this practice list two times and each time had an opportunity to recall all 10 images. The non-repeated images represent a baseline against which precall performance of the repeated images in the *previous* task will be compared. Finally, participants completed the distraction check

phase which asked whether they left their pc and/or switched applications at all during the study.

Figure 1 about here

Procedure

The study was conducted on-line using Qualtrics software to deliver all information, stimuli and record all participant input via a keyboard. It began by presenting participants with a welcome screen informing them that they are about to participate in a study that tests for extrasensory perception (ESP) and that they should click the icon to continue. From this welcome screen the Qualtrics software then pseudo-randomly allocated them to one of the four pathways (with each pathway using only one of the practice lists), using an inbuilt Mersenne Twister pseudorandom number generator (PRNG), with the proviso that the PRNG evenly select the four pathways. The PRNG uses the Unix timestamp, counted in milliseconds, as the seed for the random number generator. The first stage obtained informed consent and captured demographic information and required participants to complete the revised paranormal belief scale (Tobacyk, 2004). This was followed by the second stage, which included a relaxtion induction and check. During this stage participants were shown an image of a starfield and played some relaxing new-age type music for 3 minutes with a verbal prompt to encourage them to relax. This was immediately followed by a relaxation manipulation check which asked participants to rate on a scale from 1 (completely tense) to 10 (completely relaxed) how relaxed they felt at that moment in time. The third stage involved presenting the images to the participants in a random sequence. During each trial the relevant image was shown on screen for 3000ms along with its identifying label in font Ariel size 36pt. Once all images had been viewed participants then completed the fourth phase which was a surprise precall/recall test where they were asked to recall as many of the images as they could in 3 minutes, in any order, by typing in the name of the image using the keyboard. No stipulation was made about word-case, spelling or grammar. A timer on screen counted down from 3 minutes to provide an indication of how much time remained. Following this, participants then completed the fifth

phase, which was a post-precall/recall practice phase. During this phase participants were shown the 10 images (5 positive and 5 negative) from the relevant practice list one at a time as before. Once all 10 images had been presented participants were asked to recall as many of the 10 images as they could in any order by typing in their names using the keyboard. This post-precall/recall practice phase was then repeated with participants seeing the same 10 images and recalling them. Finally, participants completed a distraction check phase which required them to respond to a question asking them if at any time during the study they shifted screens to check emails, looked away from their PC, wrote down the words etc. to help their recall. Once this had been completed participants were provided with an information/debrief screen containing contact details of the Principal Investigator (PI) should they wish to obtain more information.

Ethics

Full University Faculty ethics approval was obtained for this study (Ref: 16/SAS/291C).

Results

The RPBS was coded according to Tobacyk (2004) to create the 7 sub-scales of; *traditional religious belief; Psi; Witchcraft; Superstition; Spiritualism; Extraordinary Life Forms,* and *Precognition,* and a sum of items score which was used to identify those with high (i.e., >89.1) levels of belief. Precall was measured as the number of images accurately recalled in presentation phase that were later *repeated* in phase 4 compared to those that were *not-repeated*. Given the requirement for participants to type in the name of the image it is possible that a name could be miss-spelt or that a name may only be partially typed due to the time restriction. To deal with this all incorrectly spelled items were viewed by two external judges, blind to the aims of the study, to ascertain whether they sufficiently identified the appropriate image. For partially typed responses a key criterion used was the requirement that there be a greater than 50% level of mapping between the letters and placements of the partially typed input and the name of the image. Only data from participants who are classified as *high-believers* and who completed all phases of the study were included in the main analysis.

RPBS Data

Descriptive data on the seven sub-scales and the sum of items scores of the RPBS are presented in Table 2.

Table 2 about here

Precall Data

One hundred and seven participants were each exposed to 20 images, creating a total of 2140 trials. Of these there were 154 (7.2%) 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 150 (97.4%) of the responses. This included 19 instances of accepting 'skydiving' 22 instances of accepting sky diver, 3 instances of accepting skydive, 1 instance of accepting parachuters and 1 instance of accepting skyjumping for 'skydiving'; 2 instances of accepting hang gliders, 6 instances of accepting hang gliding, 1 instance of accepting hang glinding, 1 instance of hand glider, 1 instance of sky glider, 1 instance of para glider and 5 instances of glider for 'hang glider'; 1 instance of roller coasters and 1 instance of roll coaster for roller coaster; 5 instances of car accident, 1 instance of accedent, 1 instance of car crash and 1 instance of crash accepted for 'accident'; 1 instance of fire in house, 1 instance of fire rescue, 3 instances of fireman and 3 instances of fire fighter accepted for fire; 1 instance of war image and 1 instance of warvictims accepted for 'war'; 1 instance of suicde accepted for 'suicide'; 1 instance of solders accepted for 'soldier'; 2 instances of boat sinking, 1 of ship sinking, 3 of shipwreck, 1 of boat and 1 of wreck accepted for 'ship'; 11 instances of sailor, 1 of yachting, 2 of sail, 1 of saling, and 1 of sailboat accepted for 'sailing'; 6 instances of skiing, 1 of skyer, 1 of ski jump, and 1 of skiier accepted for 'skier'; 6 instances of hiking, 2 instances of mountain climber, 1 of mountain peak hiker, 1 of hike, 1 of climber and 1 of mountain hiker accepted for 'hiker'; 1 of spaceman, 2 of astronaught, 1 of astronirt, 1 of austronaut, and 1 of astrounaut for 'astronaut'; 1 of athlete, 2 of gymnist, 1 of gymnastic and 1 of gymnastics accepted for 'gymnast'; 2 of policeman accepted for 'police'; 1 of flyer accepted for 'pilot'; 1 of gunman and 1 of child point gun accepted for 'gun'; 1 of toalet, 1 of tiolet, and 1 of disgusting toilet accepted for 'toilet'. The 4 (2.5%) trials where no

agreement was reached were excluded from the analysis. There were also 38 (1.8%) 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.

The precall scores for the positive and negatively valenced images along with their respective baselines can be seen in Table 3.

Table 3 about here

Prior to running any analysis comparing precall to baseline scores, the data was checked with regards to the parametric assumption of normality. The assumption of independence was not tested as the design utilised a repeated participants approach and as such independence would not be expected (see, Field, 2013). As recommended the assumption of normality was examined using a multiple methods approach (DeCarlo, 1997; Razali & Wah, 2011). This included a visual check method (e.g., histogram), examination of the skewness and kurtosis values along with a specific test of normality (e.g., Shapiro-Wilk test), see Table 4.

Table 4 about here

This data suggests that the distribution is not too skewed but may be slightly platykurtic, a point picked up by the Shapiro-Wilk test which suggests that the data is significantly different from normal. However, guidelines on what is an acceptable range of kurtosis generally suggest that between $\pm$ 2 is acceptable (see e.g., Gravetter & Wallnau, 2014), and Field (2013) has pointed out that significance tests, such as the Shapiro-Wilk test, when used for large samples are likely to return a significant effect 'even when the kurtosis is not too different from normal'

(p. 185). Given this there are a number of options available. The data can be examined using a non-parametric test (e.g., Wilcoxon), or the data can be transformed in some way (e.g., log transformation) in an attempt to reduce the non-normality (see, Field, 2013). Both of these approaches were taken in an effort to provide as full and meaningful examination of the data. Furthermore, 2-tailed tests were used to allow for the possibility that post-recall repetition of the images *could* impair precall performance (see, Ritchie et al., 2012).

A Wilcoxon Signed Ranks Test indicated that level of accuracy for the precall condition, *Mdn* = 6.0, did not differ significantly from the baseline condition, *Mdn* = 5.0, Z=-0.607,p=0.544. Following the log transformation, a repeated measures t test was conducted on recall scores comparing level of recall of images that were *repeated* with those that were *not-repeated*. This showed that the level of mean recall for *repeated* images did not differ from images *not-repeated* (respective means: 0.7279 vs. 0.7116), t(106)=0.800, p=0.425, 95% CI (-0.02411, 0.05675), *d*=0.10[2].

To examine possible links between participant belief in paranormal events correlations were conducted between participant's total precall scores and their scores on the RPBS, see Table 5. None of these correlations were significant (all ps>0.386). Finally, a correlation between level of relaxation and total precall score was also conducted, which showed no clear effect (r[107]=-0.146,p=0.133).

Table 5 about here

[2] A repeated measures t test conducted on the original non-transformed recall scores comparing level of recall of images that were *repeated* with those that were *not-repeated* showed that the level of mean recall for *repeated* images did not differ from images *not-repeated* (respective means: 5.66 vs. 5.47), t(106)=0.840, p=0.403, 95% CI (-0.266, 0.659), *d*=0.11.

Post Recall Practise

The pattern of post recall performance was examined using a paired t test. This showed that mean recall performance improved from the first (7.76) to the second (8.57) post-precall/recall practice phase, $t(106)=5.267, p<0.001$, 95% CI(-1.112, -0.507), $d=0.57$.

Discussion

The results showed no evidence of any *precall* effect when using highly emotive positive and negatively arousing images and selectively sampling from a population with high levels of belief in psi. Hence, the pre-registered confirmatory prediction was not supported. Furthermore, there was no evidence of any relationship between the various levels of belief, overall belief in psi, or level of relaxation and precall performance. Unsurprisingly however, there was some improvement in the post-recall practice phase.

That there was no clear precall effect is consistent with others who have attempted and failed to elicit such precognitive behaviours (Galak et al., 2012; Rabeyron, 2014; Ritchie et al., 2012) and as such could be taken to support a more sceptical interpretation of the reported phenomena (see e.g., Stokes, 2015; Wagenmakers et al., 2011). However, given the positive findings that have also been reported (e.g., Maier et al., 2014; Subbotsky, 2013) and the suggestive conclusions reached by those taking a broader view utilising a meta-analytic approach to precognitive effects (see e.g., Bem et al., 2015; Honorton & Ferrari, 1989; Steinkamp et al., 1998; Storm et al., 2012; Utts, 1991) it may be too early to close the door on this intriguing, though challenging, area of research. Hence, with a nod to the notion that more research is needed to help shed light on the phenomena in question (see, Franklin et al., 2014) some reflection on why no precall effect emerged in the current study may be helpful.

A strength of the current study was that the images used were specifically chosen from the IAPS database (Lang et al., 1997) on the basis that they were highly arousing and either positively or negatively valenced. Importantly, the images used here were associated with higher arousal ratings compared to images used in a previous study (Vernon, In Press) and more specifically the negative images had a greater negative valence rating (i.e., 2.32 as compared to 3.52). That said, it is still possible that these images, whilst more arousing and more negative, may not have been sufficiently stimulating. For instance, the precognitive effect reported by Maier et al. (2014) was based on their sub-set of negative images only, which had a mean valence level of 1.73, lower (i.e., more negative) than those used in the present study.

It may be that this paradigm requires exposure to severely disturbing images in order to elicit a precall effect, something that was deliberately avoided in the current study due to ethical concerns.

A further proposed strength of the current study was that it recruited from a sample of participants expected to have higher levels of belief in psi (i.e., from the College of Psychic Studies, London) with the expectation that this would encourage and/or benefit any psi type behaviour. Though an unintended consequence of this may have been reduced variability in belief scores reducing the possibility of identifying any clear relationship between belief and psi performance. Nevertheless, the original rationale for sampling from a population with potentially higher levels of belief is consistent with the evidence suggesting that belief in psi is associated with better performance on psi based tasks (see e.g., Luke, Delanoy, & Sherwood, 2008; Palmer, 1971; Parker, 2000). It was certainly the case that reported levels of belief in psi were higher in the current study than in previous work (see, Vernon, In Press) and (with the exception of religious beliefs) higher than those reported by Tobacyk (2004). However, it may be that whilst high levels of belief in psi are necessary, alone they may not be sufficient to elicit and/or encourage psi type behaviours. Furthermore, whilst it may be possible that belief alone can mediate psi performance this may also be influenced by a range of factors including, but not limited to, prior performance, experience, motivation and situation variables (see e.g., Cardena & Marcusson-Clavertz, 2015). A potentially more useful approach may be to selectively recruit participants with high levels of belief that have shown some ability to exhibit the relevant psi behaviour. Such an idea is not new as Haraldsson (1970) has previously shown that selectively recruiting promising candidates is an effective method for eliciting precognitive effects. Furthermore, a meta-analysis of precognition utilising forced-choice experiments reported significantly larger effects for those individuals pre-selected on the basis of prior testing performance (Honorton & Ferrari, 1989). Hence, it may be more fruitful for future research to selectively recruit participants based on belief *and* prior ability, ensuring the ability is consistent with one under focus as Braude (2016) quite reasonably points out psi abilities are likely to be 'as idiosyncratic and variable as any other ability' (p. 147).

Though unusual in many areas of scientific research, given the intriguing findings from Wiseman and Schlitz (1997) and the suggestion from Palmer and Millar (2015) that the primary investigator is often a good predictor of the outcome, it is incumbent on me as the primary investigator to outline my beliefs and/or expectations regarding the potential of psi based behaviours as it is possible that such views may be influencing the outcome. As a scientist I

would like to think that I remain open minded yet sceptical of psi based behaviours and effects. It is true that I am more inclined to be swayed by the data as opposed to rhetoric and argument and so far out of the three studies that I've conducted only one has shown what I would consider to be an anomalous effect (see, Vernon, 2015). Nevertheless, I am aware of the large body of research showing positive psi based effects and I am not convinced that incorrect statistical analyses, experimenter fraud and/or deception can easily or fully account for these findings. In fact, the field of psi based research is more proactive in encouraging researchers to use study pre-registration deposits (e.g., Koestler Parapsychology Unit, Open Science Framework) to ensure that they cannot and do not go on a statistical fishing expedition in an attempt to simply find a significant effect that can be written up and published. Furthermore, there is less of a publication bias within the field of psi based research compared to more mainstream psychological research which is evident in both the actively encouraged replication of studies as well as the acceptance and publication of null results. Hence, I remain both sceptical yet open minded with regards the notion and nature of psi and await further evidence.

Related to the above point the current study was conducted on-line with no face-to-face interactions between experimenter and participant. To some extent this was intentional in an effort to reduce any possible experimenter bias or the possibility that experimenter behaviour would influence the outcome (see, Palmer & Millar, 2015; Schmeidler, 1997). However, in an effort to reduce such potential bias this design may have *thrown the baby out with the bathwater* as it were. The possible influence of experimenter behaviour on psi related performance is not simply negative, it may also be positive. In fact, it may be a prerequisite for such behaviours to emerge. For instance, such positive effects may come from, or be based in part, on the ability of the experimenter to put the participants at ease, the verbal instructions they give, the tone of voice they use, their ability to motivate participants and instil in them a confidence of success (see e.g., Palmer & Millar, 2015). With research showing that differences in psi performance have been specifically attributed to the way experimenters interact with their participants (e.g., Honorton, Ramsey, & Cabibbo, 1975; Taddonio, 1976). Hence, in this instance, conducting the study on-line may have negatively influenced, or failed to positively influence, the outcome for this type of task, by not allowing any interaction between experimenter and participants in order to put them at their ease and/or encourage them to succeed. It is not clear whether all psi based tasks would be influenced in the same way or whether an on-line task that provided a more comprehensive relaxation induction, along with encouraging support and background information on how successful such a paradigm had been in the past, would be more effective

at eliciting psi type behaviours. Nevertheless, it is worth noting that of the three studies conducted by the PI examining precognition the only one to show an anomalous effect was one that involved direct face to face interaction prior to the task itself (see, Vernon, 2015).

A final point is that whilst the participants recruited for this study were opportunity selected from a cohort expected to exhibit high levels of belief in psi it cannot be assumed that this means the participants were highly motivated, particularly as motivation was not assessed. It is likely however that given the voluntary nature of the task and its focus on psi that participants needed to be *interested* in order to give up their time to participate. However, whilst there is a relationship between interest and motivation, particularly with regards to learning new material (see, e.g., Schiefele, 1991), it is not simply a linear one. For instance, Schiefele (1991) has suggested that the strength of an individual's interest may lead to an initial action but the level of this interest can quickly fade leading to a reduction in effort over time. Whereas high levels of motivation often lead to a more sustained level of effort. Such a point relates to the suggestion by Stanford (1974) that psi as a process may work at an unconscious level to serve the needs or motives of the individual in an adaptive manner. More specifically he suggests that the strength of a psi based effect would be 'directly and positively related to the importance' (p. 45) of any such motivational object or event. This suggestion has led to recent claims that a contingent reward should be provided to motivate and/or serve the needs of the individual in an attempt to elicit psi based precognitive effects (Luke, Delanoy, et al., 2008; Luke & Morin, 2014; Luke, Roe, & Davison, 2008; Luke & Zychowicz, 2014). The fact that no contingent reward was offered in the current study may be considered a limitation and could possibly account for the null result.

In conclusion, an attempt to uncover evidence of precall using emotive images and sampling from a cohort of individuals with high levels of belief in psi failed to elicit any positive effects. Some reflections on the methodology of the study are offered for consideration, including the precise arousal levels of the images used, the possibility of preselecting participants based on prior performance on a similar psi based task, the beliefs of the PI, the level of experimenter-participant interaction and the possibility of a contingent reward.

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Appendix A

Showing the 20 images (10 positive and 10 negative) from the IAPS database used in the 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

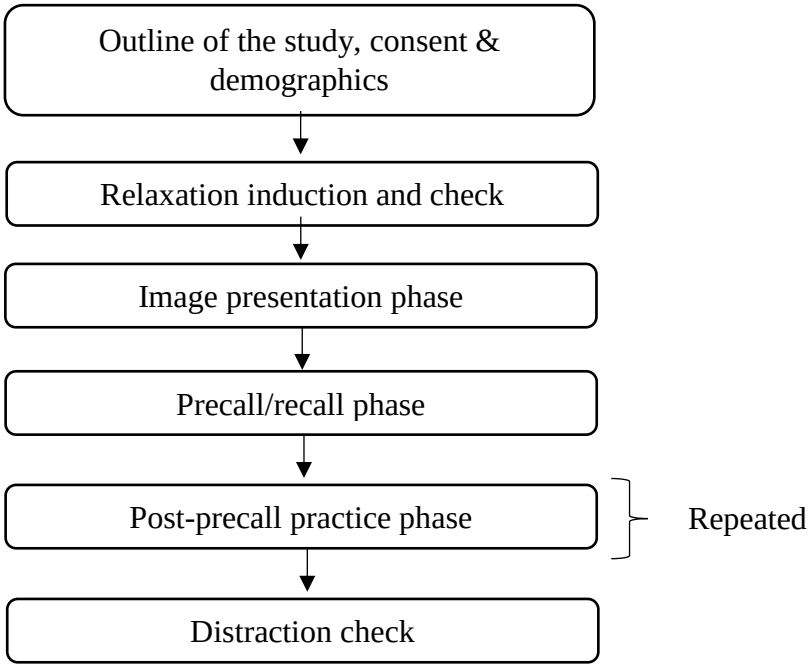

Figure 1**.** The six phases of the experiment.

Table 1. Showing mean and SD of the population sample (based on N of 217 students from the southern USA) reported by Tobacyk (2004).

	Traditional religious belief	**Psi**	**Witchcraft**	**Superstition**	**Spiritualism**	**Extra life form**	**Precognition**	**Full Scale**
Mean	6.3	3.1	3.4	1.6	2.8	3.3	3.0	89.1
SD	1.2	1.5	1.7	1.2	1.4	1.3	1.3	21.9

Hence, participants with a 'full scale' score of >89.1 will be classified as ***high-believers*** and those with a 'full scale' score of <89.1 will be classified as ***low-believers***.

Table 2. Showing participants mean and SD scores for each of the seven sub-scales, as well as the sum of items, on the RPBS.

	Traditional religious belief	**Psi**	**Witchcraft**	**Superstition**	**Spiritualism**	**Extra life form**	**Precognition**	**Sum of items**
Mean	4.89	5.05	4.84	1.71	5.78	4.44	4.65	116.92
SD	1.22	1.06	1.49	1.04	0.93	1.13	1.19	17.03

Table 3. Showing mean number of images (with SD) recalled (out of a total of 10) in the *repeated* and the *non-repeated* conditions for the positively and negatively valenced images and for the total combined.

	Positive		Negative		Total	
	Repeated	Not repeated	Repeated	Not repeated	Repeated	Not repeated
Mean	2.42	2.36	3.24	3.10	5.66	5.47
SD	1.16	1.10	1.28	1.27	1.83	1.79

Table 4. Showing the skewness and kurtosis values with standard error(SE), and Shapiro-Wilk results for the precall and baseline data.

	Precall Data	**Baseline Data**
Skewness	0.099 (0.23)	0.034 (0.23)
Kurtosis	-0.669 (0.46)	-0.744 (0.46)
Shapiro-Wilk	0.958(107)p=0.002	0.958(107)p=0.002