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# TESTING HOME DREAM PRECOGNITION AND EXPLORING LINKS TO PSYCHOLOGICAL FACTORS.

By

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*Summary*

Precognition refers to the idea that an individual may be able to obtain information about a future event via a non-usual route, prior to the event occurring. Over time various paradigms have been developed to elicit and test for such effects. Here, we focused on dream precognition as dreaming represents a naturally occurring altered state of consciousness that may facilitate such anomalous experiences. Using a home-dream paradigm we examined whether participants would be able to dream about and rate a future target image as more similar to their dreams compared to decoy images. We also examined the potential relationship between dream precognition and sensory processing sensitivity, transliminality, boundary thinness and anomalous experiences and belief. One hundred and one participants completed an initial practice trial, to familiarise themselves with the procedure, followed by the main trial. In each trial participants were required to dream of a future target image that they would later be shown. During each trial, after they had completed their dreaming, participants were randomly presented with a set of four images and required to rate them in terms of how much similarity there was between each image and their dream on a scale from 1 to 100. Results of the main trial showed that ratings for the target image were significantly higher than the decoy images. However, no clear relationships were found between precognitive target ratings and sensory processing sensitivity, transliminality, boundary thinness or anomalous experiences and belief. We conclude that the result is not due to any methodological artifacts and as such represents suggestive evidence for dream precognition. Given the logistical simplicity of the home-dream paradigm we would encourage other researchers to replicate our findings and explore what may be a fruitful avenue of research.

*Keywords:* dream precognition, sensory processing sensitivity, transliminality, boundary thinness, anomalous experience, anomalous belief.

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# 1. Introduction

Precognition suggests an ability to perceive and/or behave in a way that may be influenced by future events that would not be anticipated or known about through any standard anticipatory process (Bierman & Bijl, 2014; Franklin et al., 2014; Mossbridge et al., 2014). Despite the anomalous nature of precognition such experiences are relatively common in the general population. For instance, a survey of anomalous experiences in a sample of 1,000 British individuals showed that just over 35% reported premonitions of events that had yet to take place (Pechey & Halligan, 2012). When focusing on precognitive dreams this number tends to be even higher. For instance, researchers have shown that between 38% and 70% of those sampled report experiencing at least one precognitive dream (Monteiro de Barros et al., 2022; Schredl, 2009; Thalbourne, 1994). Such precognitive insights may have important implications as others have shown that a substantial proportion (45%) of those reporting such experiences may change their future travel plans as a result (Mack & Powell, 2005).

Over time, a range of paradigms have been developed to elicit and assess various precognitive behaviours, including retroactive facilitation, which involves repeating information after a task rather than before to improve recall (e.g., Bem, 2011; Vernon, 2017); unexplained anticipation, being able to 'guess' something before it happens, so for example, which light will come on out of a set of four (e.g., Haraldsson, 1970; Schmidt, 1969); precognitive preference, such as whether participants prefer a positive or arousing image using precognition (Maier et al., 2014); presentiment, having a physiological response occur before being presented with a stimuli (e.g., Bierman & Radin, 1997; Radin, 2004); and dream precognition where participants attempt to dream of future events (Schredl et al., 2010).

Although each of these paradigms have their strengths and weaknesses, the use of dreams to elicit and assess potential precognitive effects may be particularly fruitful for a number of reasons. For instance, dreaming represents a naturally altered state of consciousness (ASC), wherein the individual exhibits a distinct profile of psychological functioning relative to their normal waking/alert state. This is potentially useful as prior research has suggested that an ASC may often act as a facilitator for anomalous experiences, such as precognition (Braud, 1975; Honorton, 1977). Furthermore, dreaming is a convenient focus as it occurs naturally and requires no special induction procedure or training. Moreover, dreams often contain a rich selection of visual images, sensations, thoughts, emotions, apparent speech, and motor activity (see, Scarpelli et al., 2022), and as such the potential precognitive target may be embedded in the imagery or sensations of the dream content. In addition, the dream state is thought to be

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particularly conducive to the expression of such anomalous behaviours because the field of consciousness is reduced in a way that is similar to that seen in the Ganzfeld sensory deprivation paradigm, where external sensory stimulation is reduced or blocked (Sherwood & Roe, 2003). In this way the dream state may facilitate the precognitive signal, giving it the best chance of being detected.

Early empirical research into the possible veracity of dream precognition was often carried out at a sleep laboratory, such as the Maimonides Medical Center (Krippner, 1993). Such research often required participants to sleep over night at the laboratory whilst their brain activity was monitored by electroencephalogram (EEG) and their eye movements assessed by electro-oculogram (EOG) to ascertain the precise stage of sleep (Sherwood & Roe, 2003). The rationale for EOG was that a highly active brain, along with jerky eye movements, is often indicative of the rapid eye movement (REM) phase of sleep, and research had shown that awakening an individual during this phase is more likely to enable the participant to recall their dream(s) (Goodenough, 1981). Reviews and a meta-analysis of this approach have suggested that it produced some encouraging findings (see e.g., Mossbridge & Radin, 2018; Sherwood & Roe, 2003; Storm et al., 2017).

However, Storm et al. (2017) noted that the prohibitive costs associated with running a sleep lab, with all the necessary equipment and research staff involved, may have discouraged researchers from attempting to replicate this type of work. Nevertheless, researchers keen to examine the nature and veracity of dream precognition have worked to develop alternative paradigms, such as the home-dream approach (Sherwood & Roe, 2003). The rationale here is that this approach is both more realistic and potentially more useful as the dreamer is allowed to sleep at home, as normal, and attempts to dream of a specific target that they will be shown at a future date. They are encouraged to either self-record their dreams using a dream-diary and/or input their responses via an online link to potential targets. Nevertheless, despite the potential that this paradigm offers there has only been a limited amount of research to date that has utilised such an approach and this has produced some inconsistent findings.

For example, an early study by McLaren and Sargent (1982) using the dream diary approach with a single participant, required to rank a set of four images, produced results that were no better than chance. Using a similar dream diary procedure Sherwood et al. (2002) had three participants dream at home about potential future target images and then individually rate and rank-order a set of four images. These individual rankings were also combined to form a group objective consensus judgement. However, there was no evidence of dream precognition using either individual or consensus judging methods. More recently Watt (2014) used an online

submission procedure to examine whether participants would be able to dream at home of a target video clip that they would be shown later. Initial results suggested evidence of a precognitive dream effect. However, a possible self-selection bias was found to have inflated the original hit rate, which when accounted for reduced the overall significance of the effect. In contrast, Schredl et al. (2010) found that when using a home-dream approach participants were able to accurately indicate which film they would be exposed to later. This led Schredl et al. (2010) to conclude that precognitive information was evident in the dreams of the participants in the days preceding exposure to the target film.

It is possible that various methodological differences between these studies may have contributed to the differential outcome. Nevertheless, there is some agreement in the literature that the home-dream paradigm represents a useful approach and though the present data are insufficient for drawing conclusions the findings warrant further systematic investigation using well controlled methods (Mossbridge & Radin, 2018; Sherwood & Roe, 2003; Storm et al., 2017). Hence, a primary aim of this study was to examine dream precognition using a home-dream and online submission procedure.

Our secondary aim was to explore some of the key psychological factors that may be relevant to the production, moderation of, and belief in precognitive dreams. Such a proposal is important given the argument by Mossbridge and Radin (2018) that working to understand the role such factors play in precognition is essential to gain a more comprehensive understanding of underlying processes and mechanisms. Luke and Zychowicz (2014) examined nonintentional vs intentional precognition tasks but found no difference between the conditions or any correlations between psi score and belief in psi, openness to experience and emotional creativity. However, this was not a dream precognition paradigm. Dream recall and lucid dreaming frequency, alongside the Big Five personality factors and COVID-19 worries, have also been examined. If you are open to new experiences, you are more likely to recall your dreams; also, lower neuroticism scores and COVID-19-related worries meant you were more likely to report lucid dreams (Schredl et al., 2022a). However, the effect sizes for this study were small. In the same vein, Schredl et al. (2022b) looked at SPS, the five-factor model, and reported lucid dream frequency, finding that two of the factors of SPS (Aesthetic Sensitivity and Low Sensory Threshold) were positively correlated, along with extraversion and low agreeableness with lucid dream frequency. Indicating the link between dream frequency and SPS.

One candidate variable that has received only limited attention in terms of its relationship with anomalous experiences and has yet to be explored in terms of its relationship with precognition,

is the personality trait of Sensory Processing Sensitivity (SPS; see Greven et al., 2019). SPS has been suggested to be a continuously distributed trait with higher levels of SPS associated with deeper processing of information, greater empathy and emotional reactivity, and being able to sense subtleties in the environment (Greven et al., 2019). Williams et al. (2021) investigated people who were high in SPS and if they were better at recognising degraded auditory stimuli or would hear words that were not there (auditory pareidolia). They found that people with higher SPS could correctly recognise the degraded auditory stimuli. There was no correlation with the study's pareidolia aspect, but both recognition and pareidolia were associated with more anomalous experiences being reported. This indicates that SPS may be a relevant variable when examining precognition.

Individuals exhibiting SPS are classified as Highly Sensitive Persons (HSPs) and can be identified using the Highly Sensitive Person Scale (HSPS) developed by Aron and Aron (1997). Some promising initial research by Irwin et al. (2015) has shown that HSPs exhibit an increased proneness to anomalous experiences. In addition, Aron et al. (2012) also noted that HSPs report more meaningful and vivid dreams and had more highly developed unconscious processing abilities and intuition, qualities which have been suggested to be particularly useful for exhibiting more robust precognitive effects (Bem et al., 2015). According to Aron et al. (2012) HSPs might also have more rapid and efficient unconscious processing, commonly called intuition; more useful dreams; or heightened suggestibility. In addition, HSPs have been shown to report more altered states of consciousness, which naturally occur through dreaming (Jonsson et al., 2014). Such findings are suggestive of a potential link between SPS and precognition.

Alongside SPS we also examined some psychological aspects of behaviour that have previously been linked with precognition. This included transliminality, boundary thinness, and belief in anomalous phenomena. According to Thalbourne and Houran (2000) transliminality reflects the proposed tendency for material to cross into or out of the threshold of conscious awareness. They argue that it represents a core constituent of paranormal experience and may well predict scores on tests used to measure such behaviours. Indeed, Valášek et al. (2014) found that transliminality was positively associated with precognitive dream belief and experience. Boundary thinness has also been linked with both dreaming and anomalous behaviour performance. Boundary thinness is proposed to relate to a thinking style that recognises the potential connectedness between psychological processes and is associated with a more nuanced or subtle level of thinking and discrimination (Hartmann, et al., 1998). Research has shown that those classified as having thin boundaries report more frequent dream

recall and more intense dreams compared to those classified as having thicker boundaries (Schredl et al., 1996). In addition, boundary thinness has been shown to be subjectively associated with anomalous performance (Richards, 1996), and tends to be higher among those who consider themselves psychic (Krippner et al., 2000). Finally, belief in anomalous phenomena has been widely studied (see Irwin, 1993 for a review) and a meta-analysis of forced-choice precognition experiments showed a small but significant relationship between belief and performance, such that people who believe in anomalous phenomena tend to exhibit better precognitive performance than those who do not (Zdrenka & Wilson, 2017).

## 2. Objectives

There were two main objectives to the study. First, to test for possible dream precognition using a home-dream paradigm by examining the difference in participant similarity ratings between the target image compared to the decoy images. Second, to explore the possible relationships between precognitive dream performance and sensitivity (HSP-12 and subscales), transliminality (RTS), boundary thinness (BQ) and anomalous experiences and belief.

## 3. Methods

### 3.1 Pre-registration

This study was pre-registered at the Koestler Parapsychology Unit (ref#1067:http://www.koestler-parapsychology.psy.ed.ac.uk/Documents/KPU_Registry_1067.pdf) and a copy of the raw data uploaded to the site.

### 3.2 Participants

Using a similar home-dream precognition procedure Watt (2014) produced an effect size of 0.16 with a sample size of $N$=50 which is consistent with that reported in the meta-analysis of precognitive dream research by Storm et al. (2017) of 0.17. Hence, to ensure sufficient statistical power, and avoid the criticism of optional stopping and participant fatigue, this study remained active until at least 100 participants had completed all aspects of the study. To facilitate this, links to the online study were distributed across several sites, and participants were opportunity sampled from the undergraduate psychology student population, and the Society for Psychical Research. A total of 101 participants completed the study, all of whom were screened to ensure that they dreamed regularly and recalled their dreams. This consisted of 82

(81.2%) females, 17 (16.8%) males, and 2 (2%) non-binary, with ages ranging from 18 – 79 years (*M*=35.17 years, *SD*=13.85 years). In terms of ethnicity, 74 (73.3%) participants self-classified as 'English/Welsh/Scottish/Northern Irish', 1 (1%) 'Irish, 4 (4%) European Union, 1 (1%) 'Polish', 1 (1%) 'Bangladeshi, 2 (2%) 'Indian', 2 (2%) 'Pakastani', 3 (3%) USA, 1 (1%) 'Canada', 1 (1%) 'Norway', 1 (1%) 'Chinese' 7 (7%) as 'Other' and 3 (3%) as 'Prefer not to say'. Participation was voluntary, and all provided informed consent to take part. Of the 115 participants that originally completed the practice trial 101 (88%) went on to complete the main trial. The study had ethical approval from the host institution Faculty Research Ethics Committee (Ref: ETH2021-0171). All participants were paid £20 in online shopping vouchers for completing the study.

## 3.3 Research Instruments

### 3.3.1 Software

The study utilised Qualtrics software to present material online and required a standard keyboard for entering responses. This software presentation/capture platform uses an inbuilt Mersenne Twister pseudorandom number generator (PRNG), with the proviso that the PRNG evenly select the pathways to the sets of images. The PRNG uses the Unix timestamp, counted in milliseconds, as the seed for the random number generator.

### 3.3.2 Test Images

Images for the dream precognition component all came from the International Affective Picture Systems (IAPS) database (Lang et al.1997). A selection of images from IAPS was used to create a stimulus pool of 44 images divided into 10 main stimulus sets and one practice set with each set containing 4 images (i.e., 1-target and 3-decoys) with high emotional content (i.e., positive valence and arousal) as prior research has suggested that these may be better at eliciting precognitive effects (Maier et al., 2014; Radin, 2004). Each of the ten main stimulus sets was matched for mean arousal and valence based on measures available from IAPS; see Figure 1 for examples. Selection of the main stimulus sets for each participant was carried out by the Qualtrics software using its own inbuilt randomiser whereas selection of the target within the set was based on an online random source generator (e.g., https://www.random.org/) which utilises atmospheric noise and as such is a true random source.

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Figure 1 about here

3.3.3 Psychological Scales

The psychological components assessed were levels of sensitivity, transliminality, boundary thinness and anomalous experiences. Sensitivity was measured using the HSP-12. This is a 12-item self-report measure of SPS, created by selecting items from the original 27-item HSPS (Aron & Aron, 1997) that loaded strongly on the bifactor structure detected in previous studies (Lionetti et al., 2018). Each of the 12 comprising items is rated on a 7-point Likert scale. The items are then averaged to obtain an individual's total mean score. The HSP-12 has shown good psychometric properties and correlation between the two scales is very high, with $r = .94$ (Pluess et al., 2023).

Transliminality was measured using the Revised Transliminality Scale (RTS) which is a 17-item transliminality scale that corrects age and gender biases in the original scale, is unidimensional by a Rasch, and has a reliability of .82 (Lange et al., 2000). The scale defines a probabilistic hierarchy of items that address magical ideation, mystical experience, absorption, hyperaesthesia, manic experience, dream interpretation, and fantasy proneness.

Boundary thinness was measured using the Boundary Questionnaire (BQ-18) which requires participants to rate 18 item statements from 0 to 4 (0 indicates "not at all true of me"; 4 indicates "very true of me") relating to boundary statements. An example of a 'thick boundaried statement' is: "A good organization is one in which all the lines of responsibility are precise and clearly established". An example of a 'thin boundaried statement' is: "My feelings blend into one another". The BQ-18 total score equals the sum of all the items, with higher scores indicating boundary thinness. This shorter version has demonstrated an alpha reliability of .93 and test-retest reliability of .77 (Hartmann et al., 2001).

Anomalous experiences were measured using the Anomalous Experiences Inventory (AEI) which is a 70-item questionnaire designed to investigate unusual, anomalous and paranormal experiences, beliefs and abilities, as well as including questions relating to drug and alcohol use and fear of the paranormal (Gallagher et al., 1994). It is scored by answering True or False to a number of statements. It has numerous subscales: anomalous/paranormal experiences (29 items), anomalous/paranormal ability (16 items), anomalous/paranormal belief (12 items), paranormal fear (6 items), and use of drugs/alcohol (7 items) and adequate psychometric properties.

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## 3.4 Procedure

All participants were initially screened to ensure that they regularly dream and are able to recall their dreams. They were then given a unique four-digit ID code to enable us to match their questionnaire responses to their dream precognition responses. They then completed the HSP-12, AEI, RTS, and BQ with order counterbalanced across participants. Given the recommendation by Storm et al. (2017) that home-dream studies allow at least one night for the participants to adjust to the study demands before the experiment begins, each participant completed one *practice trial* using the designated set of practice images, which was not included in the analysis. This was followed by the main trial. Both the practice (on the first week) and main trial (on the second week) were identical in procedure and carried out over two nights (i.e., Monday and Tuesday). On the Monday participants were sent an email prompt reminding them that they would need to try and dream of the target on Monday and Tuesday night and to write down their dreams in a dream diary as soon as they wake each morning (i.e., Tuesday and Wednesday). On the Wednesday they were sent a link to a Qualtrics software page. This initially required them to enter their ID code and write a summary of their dreams from their dream diary. Once they had completed this they moved on to the 'Target' page. This page contained one set of four images from the practice set (for the practice trial) or one set of four images from one of the ten main stimulus sets (for the main trial) randomly selected ensuring an even distribution across participants. Participants were then required to indicate how much similarity they felt there was between each image and their dream using a scale of between 1 and 100, where 1 = no similarity and 100 = complete similarity. No tied ratings were permitted and to help discourage this participants were also asked to identify the correct target from the four images using a forced-choice task. This completed their trial.

On the Thursday a researcher identified which stimulus set each participant had been exposed to. From this set of 4 images one image was randomly identified as the target using an on-line random source generator (e.g., https://www.random.org/) and given that research suggests that providing feedback can facilitate precognition (e.g., Honorton & Ferrari, 1989; Steinkamp et al., 1998) a 'feedback link' was sent to each participant identifying the correct target from the set. For the practice trial, to provide additional encouragement and address the potential drop-out rate, participants were also told not to worry if they did not identify the correct target in this first trial and that it often takes a couple of trials for the effect to emerge. For the main trial they were simply thanked and provided with additional debrief information.

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## 4. Results

All scales were initially checked for reliability. Differences in similarity ratings were then examined (i.e., the rating between 1 and 100 indicating how much similarity participants feel there is between each image and their dream) between the *target image* compared to the *three decoy images*. This was followed by exploratory correlational analysis examining the possible relationships between precognitive dream performance (i.e., mean similarity rating for target image) and sensitivity (HSP-12 and subscales), transliminality (RTS) and boundary thinness (BQ-18), and the three main sub-scales of the Anomalous Experiences Inventory (AEI: belief, experiences, abilities).

### 4.1 Scale Reliabilities

The internal consistencies (Cronbach's alpha) of the various scales were, HSP-12: sensitivity scale, a=0.82; RTS: transliminality scale, a=0.82; BQ-18: boundary thinness, a=0.65; AEI subscales of paranormal beliefs, a=0.77; paranormal experiences, a=0.86; and paranormal abilities, a=0.79.

### 4.2 Precognitive target and decoy ratings

Results relating to the mean similarity ratings given to the target and non-target (i.e., decoy) images are based on the data from 101 participants. Descriptive data are presented in Table 1.

Table 1 about here

Analysis, using a two-tailed repeated measures t test, compared the mean similarity ratings for the *target* image to that of the mean for all three *decoy* images combined. This showed that ratings for the target image were significantly higher (29.04 vs 21.37 respectively; $t(100)=2.55$, $p=0.012$, 95% CI (1.71, 13.62), $d= 0.25$). Examination of the scores for the practice trial shows no evidence that their ratings for the target were higher than for the main trial. In fact, they were lower in the practice trial compared to the main trial (21.6 and 29.04

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respectively). Furthermore, there was no difference in participants' ratings of the target compared to the decoys in the practice trial ($p$=0.31).

## 4.3 Correlational analysis

Correlational analysis examined the possible relationships between precognitive dream performance (i.e., mean similarity rating for target image) and sensitivity (HSP-12 and subscales), transliminality (RTS), boundary thinness (BQ-18) and anomalous beliefs, experiences, and ability (AEI and subscales) (Table 2).

Table 2 about here

These showed no clear or significant relationships between mean target ratings and the HSP-12 (and subscales), RTS, BQ-18 or AEI subscales.

# 5. Discussion

Participants rated target images significantly higher than the decoy images. However, there was no relationship between these target ratings and participants self-rated levels of sensory processing sensitivity, transliminality, boundary thinness or anomalous experiences, beliefs and abilities.

That participants rated the target images higher than the decoys is suggestive of a potential precognitive dreaming effect. However, it is important to try and rule out potential methodological issues or artefacts that may have influenced and/or biased the results. For example, given that participants were required to complete a practice trial before the main trial it is possible that those who performed badly in the practice trial, and/or were disappointed with their performance, may have dropped out and not continued with the study. This could have led to a self-selecting bias where only those performing well in the practice trial went on to complete the main trial. If this were the case the expectation would be that practice trial target ratings would be higher than those for the decoy trials, and/or that target

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ratings for the practice trial would be higher than those in the main trial. However, the data do not support this interpretation. Hence, it is not the case that only those that performed well on the practice trial went on to complete the main trial. However, given that performance in the main trial was significantly better for the target image does at least suggest that the inclusion of a practice trial, to enable participants to familiarise themselves with the procedure, may be beneficial (see, Storm et al., 2017).

An alternative possibility, given that the mean target ratings were compared to the grand mean of the ratings for the three decoy images, is that mean ratings for one of the decoy images could have been higher than that for the target image if one or both of the remaining means was substantially lower. However, as can be seen from the descriptive data in Table 1 the mean target rating was higher than the ratings for all three decoy images, which were all reasonably similar. Hence, the difference between ratings for the target compared to the decoys is not an artefact of the comparison between a mean and a grand mean.

It could be argued that the target pool was limited resulting in participants having been assigned the same stimulus set, albeit randomly, leading to a stacking effect and similarities in 'guessing' due to image preference (see Milton & Wiseman, 1997, p.93). However, if stacking effects were to explain the potential precognitive effects found in the main trial, we would have expected to see the same effect during the practice trial when the participants saw the same set, which was not the case. Nevertheless, future studies could investigate whether number of stimulus sets in relation to number of trials or participants has an impact on precognitive effect, which has not been explored to date. Due to the forced choice nature of the study, if the participant did not dream on the night of the task, they guessed the target and gave a low rating. This potentially reduced the power of the study. Also, the variation between participants and how they rated targets could have been examined to see if some were more precognitive than others. Finally, future studies could look at improvements in precognitive ability over time.

That the study was conducted online and that the targets were identified *after* participants had completed their rating tasks indicates that there would have been little or no possibility for any sensory leakage of information regarding the target prior to participants completing their ratings. Hence, the robust methodology of the study precludes such a possibility from influencing the results. As such, the data would strongly suggest that participants were able to dream about a future target image with sufficient ability to rate that target image as more similar to their dreams than the decoy images. Such a finding would be consistent with others

reporting positive precognitive dreaming effects (e.g., Schredl et al. 2010) and more broadly that dream ESP is a genuine effect (Storm et al., 2017). Such a finding would also be consistent with the suggestion by Mossbridge and Radin (2018) that the non-conscious mental processing associated with dreaming may well be responsible for precognition. Furthermore, it would support the suggested links between expressions of anomalous behaviour occurring during an ASC (Bem &Honorton, 1994).

The basis of precognition is not yet fully understood, but, given its seemingly paradoxical nature Radin (1997) has suggested that it may represent a glimpse into probable future information as opposed to certain future events. Various models have been put forward in an attempt to account for possible precognitive effects including the Multiphasic Model of Precognition (MMPC: Marwaha & May, 2016), Consciousness Induced Restoration of Time Symmetry (CIRTS: Bierman, 2010; Bierman & Bijl, 2014), First Sight Theory (FST: Carpenter, 2012), and the Block Universe Model (Taylor, 2014). FST is more general to psi, and the other models are more specifically licked to precognition. However, at present, it is not possible to differentiate between these models in terms of the current findings. In fact, given the variety of behavioural expressions of precognition, from dream precognition to presentiment, Mossbridge and Radin (2018) point out that it is unclear at present whether precognition would be underpinned by a single mechanism or many.

Whilst we would argue that the current findings are indicative of a precognitive dreaming effect, we agree with the cautionary approach suggested by Watt (2014), noting that such an anomalous finding may still be due to some undetected artifact and as such should be interpreted with caution pending replication. Nevertheless, it does suggest that home-dreaming using such a procedure may represent a potentially promising avenue of research.

This study found no clear evidence of any relationship between dream precognition and measures of sensitivity, transliminality, boundary thinness or anomalous belief and experiences. This is the first-time potential links between dream precognition and sensory processing sensitivity have been explored. Given the null results the most parsimonious explanation is that none of the proposed relationships exist. However, a plausible alternative is that our sample may have been skewed in terms of participant's sensitivity levels, limiting variability, which in turn could have negatively affected the possibility of identifying a correlation. For instance, Lionetti et al. (2018) have suggested that a normal distribution of sensitivity would classify 31% as highly sensitive, 40% as medium and 29% as low. Our sample, in contrast, contained 69% highly sensitive, 20% medium and 11% low. It is possible

that the higher number of highly sensitive individuals that took part in our study reduced the variability in scores which in turn could inhibit the possibility of finding any correlation between their level of sensitivity and precognitive performance. Hence, future research could directly address this problem by ensuring a more even split among the classifications of sensitivity.

An alternative possibility is that the scale used (i.e., HSP-12) was insufficiently sensitive. For instance, Evans and Rothbart (2008) have suggested that the HSP scale, which is thought to be comprised of three factors: Ease of Excitation, Aesthetic Sensitivity, and Low Sensory Threshold, may in fact be better conceptualised using a two-factor structure, containing negative affect and orienting sensitivity. Hence, it is possible that the HSP-12 scale lacks sufficient sensitivity to identify any potential link with dream precognition and as such future research could include an alternative measure. Indeed, De Gucht et al. (2022) have recently developed a six-factor questionnaire to measure sensory processing sensitivity called the Sensory Processing Sensitivity Questionnaire (SPSQ). Future researchers could include this measure, along with the HSP-12 for comparison purposes, to explore potential links between precognition and sensitivity.

That no clear relationship was found between dream precognition and transliminality or boundary thinness is consistent with the negative findings of others (Luke & Zychowicz, 2014; Thalbourne, 1996). Though it should be noted that in both of these cases the researchers failed to find any evidence of precognition. Nevertheless, others have reported a small but significant relationship between precognition and belief in anomalous experiences (Zdrenka & Wilson, 2017). Though this was primarily reliant on a questionnaire based on the sheep-goat scale (see Thalbourne & Delin, 1993). This questionnaire measures various aspects of anomalous behaviour and belief classifying those with higher scores as ‘sheep’ and those with a more sceptical outlook as ‘goats’. Hence, it is possible that the AEI (Gallagher et al., 1994) used in the current study, which measures experiences, beliefs and abilities, is both a more subtle and sensitive measure. Future researchers could empirically examine this by including multiple measures of anomalous belief and experience.

In conclusion, the results of the study suggest that when using a home-dream paradigm participants were able to precognitively dream about a future target image. We hope that the apparent efficacy of such an approach, relative to traditional dream-lab based research, will stimulate other researchers to explore what we think is a promising paradigm. We found no clear links between precognitive dreaming and sensory processing sensitivity, transliminality,

boundary thinness and belief and experience in anomalous behaviour. It may be that no such links exist. However, we highlighted some methodological limitations and suggest that future researchers could fruitfully explore such a possibility.

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**Table 1.**

Means, and SD of similarity ratings for the target image (ranging from 0 – 100, with 0 = no similarity and 100 = perfect match) and for the three decoy images in the practice and main trials

| **Image** | **Practice Target Mean (SD)** | **Main Target Mean (SD)** |
|---|---|---|
| Target | 21.66 (26.46) | 29.04 (29.93) |
| Decoy 1 | 21.83 (28.24) | 22.23 (28.27) |
| Decoy 2 | 28.47 (31.82) | 22.12 (27.21) |
| Decoy 3 | 24.17 (27.80) | 19.77 (24.28) |
| Mean (SD) Decoy | 24.82 (18.91) | 21.37 (15.76) |

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**Table 2.**

Bivariate correlations between mean similarity ratings for the precognitive target images and HSP-12 (and subscales), RTS, BQ-18 and AEI (and subscales).

| | Correlation (*r*) | Sig (*p*) |
|---|---|---|
| HSP-12 | -0.14 | 0.89 |
| HSP-AES | 0.027 | 0.78 |
| HSP-LST | -0.016 | 0.88 |
| HSP-EOE | -0.037 | 0.71 |
| RTS | 0.002 | 0.99 |
| BQ-18 | 0.017 | 0.87 |
| AEI-Belief | 0.014 | 0.89 |
| AEI-Experience | 0.028 | 0.78 |
| AEI-Ability | 0.043 | 0.67 |

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