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Lance Storm

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## THE EFFECTS OF IMAGERY CULTIVATION ON PHENOMENOLOGICAL AND PARANORMAL EXPERIENCE

BY LANCE STORM

### ABSTRACT

There is evidence that imagery cultivation (IC) (Storm & Rock, 2009b) can induce a psi-conducive altered state of consciousness. However, little is known about the phenomenology (subjective experience) of psi test participants under the IC condition. This study had two main aims: (1) to determine if there is a difference between pre-IC phenomenology and post-IC phenomenology using the Phenomenology of Consciousness Inventory (PCI) (Pekala, 1991); and (2) to determine if there is a relationship between the PCI dimensions and psi performance. Our two other aims included investigation of psi effects and sheep–goat effects. The sample ( $N = 100$ ) completed the paranormal belief/experience measure Australian Sheep–Goat Scale (ASGS) (Lange & Thalbourne, 2002), as well as the PCI twice (pre- and post-IC). Participants also underwent the IC treatment (9½ minutes of relaxation and guided imagery). After the treatment they completed a psi (precognition) task—an on-screen picture-identification task using randomly generated target sets devised by May et al. (2012). Direct hitting (at 21%, where mean chance expectation (MCE) = 20% and mean rank score (2.87, where MCE = 3.00) were not significant, but the sum-of-ranks statistic was significant,  $z = -1.64$ ,  $p = 0.05$ ). Thus there was some evidence that IC is psi-conducive. Also significant was the direct hitting correlation with Absorption, and three rank-score correlations (Anger, Visual Imagery, and Volitional Control). Scores increased significantly on a number of major and minor PCI dimensions due to the IC treatment. In particular, IC induced various altered states of consciousness and increased visual imagery, with increases in vividness of those images. Sheep benefited from IC more than goats, scoring higher on direct hits (25.5%) than goats (16.7%), though rank scores were effectively the same. Sheep appeared to be affected more by IC than goats, scoring higher on one major dimension (Altered Experience) and two minor dimensions (Fear and Altered Body Image). These and other findings suggest that IC does have psychological and parapsychological influences on test participants.

### INTRODUCTION

Historically, paranormal effects (e.g., psi) and experiences have been linked to altered states of consciousness (ASCs) (Bem & Honorton, 1994; Luke, 2011). Our understanding is minimal and inconclusive in regard to the subjective experiences (i.e., phenomenology) of individuals in ASCs such as shamanic-like journeying, which is a component of the psi-conducive imagery cultivation

(IC) technique (Storm & Rock, 2009a). The purpose of the present study was to investigate experimentally the effect of IC on phenomenological experience and psi performance. One hundred participants underwent the same IC protocol. Part of this treatment involved a picture-identification task using randomly generated target sets devised by May et al. (2012). Before and after IC, participants' subjective experiences were quantified using the Phenomenology of Consciousness Inventory (Pekala, 1991), to establish a baseline for comparative purposes to determine whether an ASC is induced by IC.

### *Imagery cultivation*

For just over a decade now, a consistently successful series of studies using IC has been conducted. The primary focus of IC (besides relaxation) is to guide the imagination of the participant in order to create a mental image of a concealed or future target. Essentially, IC is based on shamanic-like journeying practices, which often include repetitive drumming and/or “voluntarily entering altered states of consciousness” (Walsh, 1989, p. 5). ASCs induced by shamanic practices are typically referred to as ‘soulflight’, ‘ecstatic journeying’, or simply ‘shamanic journeying’, and it is thought that the ‘flight’ or ‘journey’ takes the experient to distant places to access necessary knowledge, or gives access to other types of information not ordinarily available to normal conscious experience (Krippner, 2002). The link between shamanic states and psi has been reported extensively in the literature, and the ASC appears to be tied in with that psychic experience (e.g., Alvarado, 1998; Krippner, 1984; Nelson et al., 1998; Nelson & Radin, 2003; Saklani, 1988). After the IC treatment, participants try to select the target image amid three decoy images. A random number generator (RNG) is used to generate the array, and each image is ranked by the participant, with the expectation that ESP targets are ranked 1 (first choice = direct hit) more often than can be explained by chance. It is to be noted that Honorton (1985) regards the direct hit measure as a more “conservative” result (p. 54), and its meaning is easy to grasp intuitively. Other psi measures are possible, including the mean rank score and the sum-of-ranks statistic.

Storm and Rock (2009b), and Rock et al. (2012), have demonstrated the effectiveness of the shamanic-like principles underlying IC with significant or near-significant psi effects in two studies, where direct hit rates were 34.5% and 29.9%, respectively (mean chance expectation (MCE) = 25%). It is to be noted that the IC treatment is similar to the ganzfeld treatment, in that they both encourage image formation related to psi targets, and the two rates just stated are comparable to those found in the ganzfeld meta-analyses of around 30% to 31% (where MCE = 25%).<sup>1</sup> Specifically, Storm et al. (2010) found a 30% hit rate

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<sup>1</sup> For a review of the ganzfeld, see Baptista et al. (2015). Imagery in psi experimentation is also featured in dream-ESP studies (Storm et al., 2017).

in 29 new ganzfeld studies (1992 to 2008) which were four-choice designs only (p. 475). In a later meta-analysis, a total of 117 four-choice ganzfeld studies (1974 to 2018) yielded “a 30.6% hit rate” (Storm & Tressoldi, 2020, p. 209).

Storm (2019a) then simplified the original IC procedure by (a) halving the guided imagery component to a 9½-minute pre-recorded soundtrack (down from 19 minutes), (b) removing the drumming component from the soundtrack, (c) introducing background tonalities, and (d) altering the wording of the guided imagery. These changes were not merely for the sake of expediency, but were aimed at testing the limits of the protocol. Also, the number of images (actual photographs) in the on-screen array was increased from four to five, given that May et al. (2012) used five pictures per trial in their fuzzy-set-encoded target pool (for details see Storm, 2019b, p. 132). As hypothesized, Storm found that the direct-hit rate under a pure IC condition was *higher* (23.7%) than for the controls (15%), where the MCE was now 20%.

In a follow-up study using the same design, Storm and Goretzki (2021) reported a significant direct-hit rate of 25% for 200 participants, all of whom received the IC treatment. They also reported a significant mean rank score of 2.84, where MCE = 3.00. The sum-of-ranks score was also significant, though this statistic has had to be corrected (see footnote 5).

In a smaller study, Storm (2022) reported a hit rate of 25.5% (albeit non-significant, given  $N = 51$ ) for IC participants compared to 20.4% for the control group ( $N = 49$ ). The mean rank score was 2.65 for IC compared to 2.90 for controls, though again the difference is not significant due to the small group sizes. This sum-of-ranks statistic had to be corrected, and is now significant for the IC group, but not for the control group (see footnote 5).

Thus far, psi effects due to IC have been on par with those for the ganzfeld. IC is theorized (and procedurally demonstrated) to be an improvement on ganzfeld, which induces a largely *passive* state of mind and takes time to achieve it, whereas IC induces an *active* state of mind and takes little time to achieve it. Ganzfeld participants are instructed to report what they are experiencing (i.e., they give mentation), but no rigorous imaginal instruction is given to percipients that seeks to activate a ‘journey’ into the unconscious to tap psi at its source. Note that the *activating* component of IC refers purely to the means by which the target is accessed. Independent of that component, IC also generates an ASC, but we do need to uncover the nature and extent of the ASC itself in order to establish which of its components are psi-conducive and which may not be.

### *The Phenomenology of Consciousness Inventory*

Phenomenological characteristics of ASCs such as those induced under IC may be quantified using a methodology that was developed by Pekala (1985). The methodology includes the administration of the Phenomenology

of Consciousness Inventory (PCI) (Pekala, 1991). ASCs can be ‘mapped’ by quantifying: (1) the intensity of each phenomenological element, and (2) the strength of relationships between pairs of phenomenological elements. PCI data can be used to construct graphs (‘psygrams’) that pictorially represent the intensity and pattern of relationships between pairs of phenomenological elements derived from a squared correlation matrix (Pekala, 1991).

Rock and Storm (2010) found a significant difference between the IC group and the control group with regard to four PCI major dimensions (Negative Affect, Altered Experience, Visual Imagery, and Altered State of Awareness), and five minor dimensions (Anger, Body Image, Perception, Meaning, and Amount [of imagery]), with higher mean scores in all cases. Rock et al. (2013) tested three variants of IC (instructions + drumming (I+D), instructions only, and drumming only)—all three groups were again higher on all but one of the *same* major and minor dimensions (i.e., Body Image in the instructions-only condition). Rock et al. tested the difference between I+D and controls on the major dimensions (excluding Altered State of Awareness) and minor dimensions (excluding Amount)—the differences approached significance on a one-tailed MANCOVA ( $p = 0.053$ ).

For psi correlates, Rock and Storm (2010) found only one variable correlated significantly with direct hits; namely, Internal Dialogue (0.28) for the shamanic-like group only. Rock et al. (2013) did not replicate this relationship, but they found that the number of direct hits was significantly and positively correlated with Altered Time Sense, Altered Perception, and Altered Experience. In the present study, since we did not use a control group, we will only look at proposed PCI differences *before* and *after* the IC treatment to gauge the direct effect of that treatment.

### *The sheep-goat effect*

Schmeidler (1943, 1945) categorized participants in parapsychological experiments as either those who think that ESP is possible under a given experimental condition (‘sheep’), or those who rejected this possibility (goats). Paranormal belief and/or experience, as measured on sheep-goat scales, tend to be predictors of psi outcomes, with sheep often producing significant hit rates (i.e., psi-hitting) and goats often producing chance scoring or significant miss rates (i.e., psi-missing).

Palmer (1971) presented an analysis of the then-current sheep-goat literature (studies dating from 1947 to 1970). He found that 13 out of 17 experiments (76%) were in the predicted direction. Six out of the 17 (35%) produced “significant confirmations of the sheep-goat hypothesis” (Palmer, 1971, p. 402). Schmeidler and McConnell (1973) determined that the success rate was much higher, with about 80% of sheep-goat studies producing effects indicating that sheep scored higher than goats.

Palmer (1977) later reported seven new experiments since his 1971 study, where five were confirmed to have produced significant effects in the direction hypothesized, and 6 out of 7 (86%) were in the predicted direction, though not necessarily significant. In total, Palmer's two sets of studies combined give about 11 studies out of 24 (46%) that were significant and in the direction hypothesized, and 19 out of 24 (79%) that produced effects in the hypothesized direction, though not necessarily significant—a figure on par with the 80% reported by Schmeidler and McConnell (1973).

Subsequently, the sheep-goat effect (SGE) has been confirmed in two meta-analyses (Lawrence, 1993; Storm & Tressoldi, 2017). Lawrence covered a 46-year period up to 1993 (73 studies), and Storm and Tressoldi covered the period 1994 to 2015 (49 studies). The latter study confirmed most of the findings of the former: Lawrence calculated an SGE of 0.029; Storm and Tressoldi reported an SGE of 0.034; Lawrence found no relation between SGE and study quality (nor did Storm & Tressoldi). Storm and Tressoldi also reported “a significant incline in the SGE effect over a 22-year period” (p. 79).

These studies and meta-analyses adequately cover the forced-choice paradigm, but there are no meta-analyses on the SGE in free-response studies. Many free-response studies have tested the SGE and found significant correlations, in the predicted direction, between paranormal belief/experience and psi-task outcomes (e.g., Marcusson-Clavertz & Cardena, 2011; Parker, 2000; Storm & Goretzki, 2021). However, the SGE is still only suggested in free-response domains. Even under the IC condition, in the studies reviewed above SGEs in the predicted direction were not significant (Storm & Rock, 2009b), or only marginally so (Storm, 2019a), but in one case the SGE was reversed (Storm, 2022). Thus, while psi experience/belief is purported to be a somewhat consistent psi-conducive measure, further testing is required, as is planned in the present study.

### *Study design and hypotheses*

The above findings show that subjective experience (state of consciousness) appears to change using the IC treatment, but there is only suggestive evidence that these changes are conducive to the generation of source material that can be an aid to psi processes. Thus, we seek to find out if the IC condition can induce phenomenologies not characteristic of those measured at baseline PCI condition, and whether PCI dimensions (major and minor) correlate with the two psi measures, direct hitting and Rank Scores.<sup>2</sup> (*Note:* As shown in the Introduction, these two measures serve different functions, and accommodate

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<sup>2</sup> I present the various statistics so the reader can see there are different ways of gauging psi, and the reader can make their own assessment as to which is the more suitable way of assessing psi data, since certainly each method has its limitations. I make no claims about any specific statistical test result as being a proof.

different statistical approaches. Mean ranks is only one way of measuring psi and assessing psi data, but it is not necessarily the best way, and not the most conservative. The sum-of-ranks statistic has limited use beyond comparison with past performances.) Therefore, the following hypotheses are proposed. (Note: Hypotheses H1 to H4 are confirmatory; H5 and H6 are exploratory, since the PCI has not been used in a psi study featuring the revised IC protocol, and Storm (2019a) simplified the original IC procedure as explained above.)

- H1 Direct hitting (as a proportion) for the whole sample is above MCE = 20% (exact binomial test, one-tailed).
- H2 Mean rank score for the whole sample is *lower* than MCE = 3.00 (Wilcoxon signed-rank test, one-tailed).
- H3 Sum-of-ranks  $z$  score for the whole sample is *above* MCE (sum of ordinal weighted ranks formula, one-tailed; Solfvin et al., 1978, p. 99).<sup>3</sup>
- H4 There is a sheep–goat psi effect as measured on (i) direct hits and (ii) mean rank scores (Mann–Whitney test, one-tailed).
- H5 Difference scores on PCI major and minor dimensions correlate with (i) direct hitting (Pearson’s  $r$ ), and (ii) rank scores (Pearson’s  $r$ ).
- H6 PCI major and minor dimensions differ between (i) pre-IC and post-IC conditions, and (ii) sheep and goats ( $2 \times 2$  mixed-model MANOVAs). The first independent variable (factor A) is repeated measures and consists of two time points (i.e., pre-IC vs. post-IC), and the second independent variable (factor B) is between groups (i.e., sheep vs. goats). We will inspect for (i) a main effect for factor A, (ii) a main effect for factor B, and (iii) an interaction effect between the two factors regarding scores on the DVs, as we expect that sheep and goats may respond differentially to PCI changes.

Tests to be used are given at the end of each hypothesis above. Tests are one-sided for tests on pure psi effects (H1 to H3), and for the sheep–goat psi effect (H4), and two-sided for the two hypotheses involving PCI variables (H5 and H6). Critical alpha ( $\alpha$ ) = 0.05.

## METHOD

### *Participants*

The study was approved by the University of Adelaide School of Psychology Human Ethics Subcommittee (Approval Code Number 22/09). The sample ( $N = 100$ ) was mainly composed of first-year psychology students from the

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<sup>3</sup> Level of scoring is determined from the sum-of-ranks score and the corresponding  $Z$  score.  $Z = (M - U_M \pm 0.5) / \sigma_M$ , “where  $M$  is the observed sum-of-ranks,  $U_M = N(R + 1) / 2$ , and  $\sigma_M^2 = N(R^2 - 1) / 12$ . The 0.5 is the usual continuity correction and has sign opposite to that of  $(M - U_M)$ ” (Solfvin et al., 1978, p. 99). Psi hitting is indicated by a significant sum-of-ranks score that is lower (better) than MCE = 3.00.

University of Adelaide, South Australia, plus a few students who signed up via a ballot box on campus. First-year psychology students participated for course credit. They signed up through the school's Research Participation System, which advertised the study. Participants were 'unselected', with the aim of recruiting an approximately even number of sheep and goats. The mean age of participants was 22 years ( $SD = 6$  years). Of the sample, 73% were female ( $n = 73$ ) and 27% were male ( $n = 27$ ); 73% of the sample had completed year 12 (high school).

### *Measures*

Pages were presented on screen (Information, Consent, Demographics), plus the following two scales:

- *Australian Sheep-Goat Scale (ASGS)* (Thalbourne, 1995): an 18-item scale measuring belief and alleged experience of paranormal phenomena (items score 0, 1, or 2 for False, Uncertain, True, respectively). The raw range is 0 to 36; the raw mean is 18. A high score indicates belief, whereas a low score indicates absence of belief (or non-belief). The ASGS raw data are then top-down purified (Rasch scaled), resulting in the RASGS version, to eliminate age and gender bias (Lange & Thalbourne, 2002). The RASGS also has *interval-level* properties. The RASGS uses only 16 items (the two afterlife items are removed). This procedure alters the scoring range and mean (standardized mean = 25,  $SD = 5$ ). RASGS scores range from 8.13 to 43.39. Cronbach's  $\alpha$  (alpha) coefficient ranges between 0.91 and 0.95 (Billows & Storm, 2015; Storm & Thalbourne, 2005).
- *Phenomenology of Consciousness Inventory (PCI)* (Pekala, 1991): a 53-item scale used to assess the phenomenological effects of different stimulus conditions (i.e., hypnosis, meditation). The PCI contains 26 (sub)dimensions, including 12 major dimensions (Positive Affect, Negative Affect, Altered Experience, Visual Imagery, Attention, Self-Awareness, Altered State of Awareness, Internal Dialogue, Rationality, Volitional Control, Memory and Arousal), and 14 minor dimensions (Joy, Sexual Excitement, Love, Anger, Sadness, Fear, Altered Body Image, Altered Time Sense, Altered Perception, Altered or Unusual Meaning, Amount of Imagery, Vividness of Imagery, Direction of Attention (i.e., inward/outward + intensity), and Absorption) (Pekala, 1985). High scores indicate the presence of the named effects, whereas low scores indicate their absence. Participants are asked to respond to each item on a seven-point Likert scale ranging from 'Very strongly agree' to 'Very strongly disagree'. For example, "I was forever distracted and unable to concentrate on anything." The PCI has respectable psychometric properties (e.g., Pekala, 1991). For example, the PCI has



been shown to reliably discriminate between qualitatively different states of consciousness (thus supporting the scale's criterion validity), and has demonstrated good internal consistency, yielding Cronbach's  $\alpha$  coefficient values between 0.70 and 0.90 (Pekala et al., 1986).

These pages were presented on a computer in the author/experimenter's (L.S.) office/laboratory.

### *Apparatus*

(i) A gallery of 300 photographs (May et al., 2012): 12 groups  $\times$  5 categories  $\times$  5 photographs; and (ii) a true-noise random number generator (Schmidt, 1970, 1973).

### *Procedure*

- *Step 1.* All participation was on an individual basis; there was no cooperation and no collusion. Each of 100 participants was assigned to a computer set up expressly for the purpose. On the screen, the participant read the following text:

The purpose of this exercise is to investigate your state of mind before and after a guided imagery and relaxation task. The task involves listening to 9½ minutes of relaxing music with some verbal instructions, and then you try to guess a target photo among four decoys.

After reading the preliminary pages (including a request for demographic details), the participant completed the ASGS and PCI on the computer.

- *Step 2.* Via an on-screen message, all 100 participants were informed that they would undergo the IC procedure (duration 9½ minutes). The message told participants to relax in their chair, start the pre-recorded instructions, close their eyes, and listen to pre-recorded instructions adapted from Harner (1990). The instructions included the sentence:

Now visualise a photographic image before you ... Remember this information for later.

The full instructions are given in Appendix A.

After undergoing IC, participants made notes (mentation) about their impressions of the future target. All participants completed the PCI for a second time.

- *Step 3.* Target selection was done following May et al.'s (2012) recommendation. The RNG was used to select randomly one group from the twelve available, followed by one photo from each of five categories in that group, from the fuzzy-set-encoded target pool. The RNG lights are numbered on two templates (1 to 12 for the group;

and 1 to 5 on a second template for the category (the numbers 1 to 5 appear twice to use up 10 of the 12 numbers on the RNG's clockface, plus two places (6 and 12) labelled as 'spin again'). These six randomly generated numbers (one for the group and five for the category) are entered by the participant into the computer, and the program draws out the identified (numbered) set of five photos and presents them on screen for ranking (target selection is not performed until Step 5).

- *Step 4.* Once the set of five photos had appeared on the screen, the experimenter instructed the participant to rank the five photographs from 1 to 5 (1 = the most likely photo the RNG will select, 5 = the least likely photo the RNG will select). All participants ranked photos according to how well elements in the images matched their mentation; these participants were permitted to re-read their mentation in order to prompt their memory, thereby assisting them in the ranking. The experimenter (L.S.) did not offer personal interpretations of the mentation as this may have misled participants. The experimenter made sure that all participants typed their assigned rank number under each photo.
- *Step 5.* Using the same category procedure as in Step 3, the target photograph was generated. This target was one of the five already selected and ranked (MCE = 20%). The participant entered the RNG number into the computer. The computer presented the target image and found the associated rank number for that photo, and automatically presented it as feedback to the participant (e.g., if the photo was ranked 1, it was a direct hit). The participant was debriefed.

### *Data analyses*

The planned analytical components of this study involve statistically testing

- for IC-related paranormal ( $\psi$ ) performance (direct hitting and mean rank score)
- sheep-goat differences on direct hitting and mean rank score
- PCI/direct-hitting and PCI/mean-rank-score relationships
- PCI differences before and after, all in accordance with the hypotheses given above.

The IBM SPSS (Version 27) statistical package was used for all statistical analyses. Exact binomial statistics<sup>4</sup> were calculated online.

### RESULTS

All demographic and questionnaire data were used with no missing cases, as participants could not skip demographic questions or questionnaire items. The

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<sup>4</sup>Richard Lowry, Binomial probabilities: <http://www.vassarstats.net/binomialX.html>

software records the time taken to complete each questionnaire or stage of the study. Case deletions were thought to be necessary if times were unreasonably short, but this proved not to be the case. (Prior to testing data, participants who completed the PCI in an unreasonably short time of 60 seconds or less were to be deleted, as such speeds would indicate they did not read all the items.)

### *Descriptive statistics*

*Rasch-scaled Australian Sheep–Goat Scale (RASGS)*. The mean score for the raw-score version of the ASGS was 13.42 ( $SD = 9.07$ ). The distribution of scores was right skewed (skew = 0.43,  $SE = 0.24$ ). The mean score for the RASGS was 21.50 ( $SD = 7.03$ ). The skew was significant due to one case, but otherwise not significant (skew =  $-0.25$ ,  $SE = 0.24$ ). Reliability of the RASGS was high: Cronbach's  $\alpha = 0.94$ .

The median score (22.44) was used as the cut-off point to demarcate sheep from goats, with goats scoring below 22.44 ( $n = 48$ ), and sheep scoring at or above 22.44 ( $n = 52$ ). Goats' mean RASGS score = 15.74 ( $SD = 4.44$ ) and sheep' mean RASGS score = 26.81 ( $SD = 4.22$ ). The difference is significant,  $t(98) = 12.79$ ,  $p < 0.001$  (two-tailed).

Of three demographic variables (Age, Education, and Sex), only Sex correlated significantly with RASGS,  $r(98) = 0.19$ ,  $p = 0.05$  (two-tailed). The result suggests a tendency for females to have higher paranormal belief/experience than males. In fact, females had a significantly higher mean RASGS score (22.32) than males (19.29),  $t(98) = 1.94$ ,  $p = 0.05$  (two-tailed). Given the median score is 22.44, males tend to be goats, and females tend to be sheep.

*Phenomenology of Consciousness Inventory (PCI)*. The PCI was administered before and after the IC treatment but before the psi task. Means and  $SD$ s for PCI subscales (before and after) are listed in Table B1 (see Appendix B). From the table it can be seen that there were general increases (19/26 or 73%), all arguably due to either imagery cultivation (i.e., the guided imagery component), or relaxation, or a combination of the two. For example, Positive Affect (and all its three sub-dimensions) increased, but so did Negative Affect (and all its three sub-dimensions). The only decreases were Attention (and its sub-dimension Absorption), Self-Awareness, Internal Dialogue, Rationality, Volitional Control, and Arousal. As not all of these changes were significant, a more detailed discussion of the relevant findings is given in the Discussion section.

### *Planned analyses*

*H1. Direct hitting (as a proportion) for the whole sample is above MCE = 20% (exact binomial test, one-tailed)*. Direct hits (rank score = 1) and ranks 1 to 5 are listed in Table 1. Direct hitting for the whole sample was 0.21 (21 hits out of 100), or 21%, where MCE = 20%. The effect is not significant, binomial exact  $z =$

TABLE 1.

Rank Scores: Full Sample (N = 100)

Rank	Frequency	Valid (%)
1	21	21.0
2	20	20.0
3	24	24.0
4	21	21.0
5	14	14.0
Total	100	100.0

0.13,  $p = 0.441$  (one-tailed). Note the very low number of hits on rank 5 of only 14% (MCE = 20%), which is marginally significant, suggesting psi avoidance of the ‘worst-case’ non-target (i.e., avoidance of the *least preferred* picture),  $z = -1.37$ ,  $p = 0.080$ .

*H2. Mean rank score for the whole sample is lower than MCE = 3.00 (Wilcoxon signed-rank test, one-tailed).* The mean rank score for the whole sample was 2.87 ( $SE = 0.14$ ), where MCE = 3.00 (median = 3.00). The effect is not significant,  $W = 1267$ ,  $z = -1.05$ ,  $p = 0.148$  (one-tailed).

*H3. Sum-of-ranks z score for the whole sample is above MCE (sum of ordinal weighted ranks formula, one-tailed).* The sum-of-ranks statistic was calculated using the sum of ordinal weighted ranks formula (see Solfvin et al., 1978, pp. 97–99). A score (or ‘weight’) is assigned to all ranks (e.g., rank 1 scores 1, etc.), and the score counts are totalled. An ordering of observed distributions is therefore induced.<sup>5</sup> For the full sample ( $N = 100$ ), the sum-of-ranks statistic is significant,  $z = -1.64$ ,  $p = 0.05$  (one-tailed).

*H4. There is a sheep–goat psi effect as measured on (i) direct hits and (ii) mean rank scores (Mann–Whitney test, one-tailed).*

- (i) Sheep scored 13 direct hits out of 52 trials (25%), whereas goats scored only 8 out of 48 (16.7%), so the effect was in the predicted direction. However, the difference is not significant,  $U = 1,144.00$ ,  $z = 1.02$ ,  $p = 0.155$  (one-tailed).
- (ii) The mean rank score for the sheep was 2.88 ( $SE = 0.20$ ), and for the goats 2.85 ( $SE = 0.18$ ). This is a difference in the wrong direction, but it was not significant,  $U = 1,235.5$ ,  $z = 0.09$ ,  $p = 0.930$  (two-tailed).

<sup>5</sup> Due to a transcription error in the formula to calculate  $\sigma_M^2$  (see Storm & Goretzki, 2021, Note 4, p. 59), Storm and Goretzki misreported the sum-of-ranks statistic as “ $z = 3.98$ ” (p. 48), which should be  $z = 1.63$  ( $p = 0.05$ ). Also, five sum-of-ranks scores are incorrect in Storm (2022). Full sample,  $z = -1.59$ ,  $p = 0.056$  (not “ $z = -0.68$ ,  $p = 0.248$ ”); IC group,  $z = -1.75$ ,  $p = 0.040$  (not “ $z = -1.03$ ,  $p = 0.152$ ”; p. 106); Controls,  $z = -0.45$ ,  $p = 0.326$  (not “ $z = -0.28$ ,  $p = 0.390$ ”; p. 106); sheep,  $z = -0.34$ ,  $p = 0.367$  (not “ $z = -0.20$ ,  $p = 0.421$ ”; p. 106); goats,  $z = -1.91$ ,  $p = 0.028$  (not “ $z = -1.18$ ,  $p = 0.119$ ”; p. 106).

*H5. Difference scores on PCI major and minor dimensions correlate with (i) direct hitting (Pearson's  $r$ ), and (ii) Rank scores (Pearson's  $r$ ). All tests were two-tailed.*

- (i) Direct hitting: Only one correlation out of 26 was significant: Absorption,  $r(98) = -0.21, p = 0.037$ .
- (ii) Rank score: Three correlations out of 26 were significant: Anger,  $r(98) = -0.20, p = 0.046$ ; Vividness,  $r(98) = 0.21, p = 0.040$ ; Volitional Control,  $r(98) = 0.22, p = 0.030$ .

No new correlations replicated the correlations in Rock and Storm (2010), although the direct-hits/Perception correlation found by Rock et al. (2013) was effectively replicated (only marginally) as rank-scores/Altered-Perception (though negative, it implies the same effect—better ranks tend to occur with bigger increases in Altered Perception),  $r(98) = -0.18, p = 0.080$ .

*H6. PCI major and minor dimensions differ between (i) pre-IC and post-IC conditions, and (ii) sheep and goats ( $2 \times 2$  mixed-model MANOVAs).* The first independent variable (factor A) is repeated measures and consists of two time points (i.e., pre-IC vs. post-IC), and the second independent variable (factor B) is between groups (i.e., sheep vs. goats).

- (i) *Factor A (pre-IC/post-IC)—major PCI dimensions.* There was a significant difference between group means for the combination of variables in the MANOVA,  $F(12, 87) = 11.68, p < 0.001$  (Wilks'  $\lambda = 0.38$ ; partial  $\eta^2 = 0.62$ ). Main effects were found. Ten of the 12 major dimensions were significant—statistical results are listed in Table B1 (see Appendix B). Positive Affect, Altered Experience, Visual Imagery, Altered State of Awareness, and Memory all *increased* post-IC. Self-Awareness, Internal Dialogue, Rationality, Volitional Control, and Arousal all *decreased* post-IC.

*Factor A (pre-IC/post-IC)—minor PCI dimensions:* Wilks'  $\lambda = 0.31$  (partial  $\eta^2 = 0.69$ ), and the multivariate test was significant,  $F(14, 85) = 13.64, p < 0.001$ . Significant main effects were found. Ten of the 14 minor dimensions were significant (see Table B1, Appendix B). Joy, Love, Altered Body Image, Altered Time Sense, Altered Perception, Altered Meaning, Amount (of Visual Imagery), Vividness, and Direction (of Attention) all *increased* significantly post-IC, whereas Absorption (Attention) *decreased* significantly.

- (ii) *Factor B (sheep-goat)—major dimensions.* Wilks'  $\lambda = 0.69$  (partial  $\eta^2 = 0.31$ ) and the multivariate test was significant,  $F(12, 87) = 3.24, p < 0.001$ . There were factor B (sheep-goat) differences on five major dimensions: Positive Affect, Negative Affect, Altered Experience, Visual Imagery, and Altered State of Awareness. Sheep showed greater increases than goats after IC. However, as assumptions for ANCOVA were met (in particular, before-IC and after-IC variables were linearly

TABLE 2.

*Significant Sheep–Goat Differences on Major and Minor PCI Dimensions*

PCI dimension (Major and Minor)	Sheep		Goats		$F^*$	$p$	Partial $\eta^2$
	$M$	$SD$	$M$	$SD$			
<b>Altered Experience</b>	4.00	0.85	3.42	0.96	5.82	0.018	0.06
Fear	2.61	1.68	1.88	1.17	3.61	0.060	0.04
Altered Body Image	4.35	1.16	3.53	1.16	9.92	0.002	0.09

\* $df_1 = 1; df_2 = 97$ .

related, and there were no significant sheep–goat interaction effects on the five dimensions), a series of two-tailed ANCOVA tests were run. No test results were significant except for Altered Experience (see Table 2).

*Factor B (sheep–goat)—minor dimensions.* Wilks'  $\lambda = 0.72$  (partial  $\eta^2 = 0.28$ ) and the multivariate test was significant,  $F(14, 85) = 2.41$ ,  $p = 0.007$ . There were factor B (sheep–goat) differences on 11 of 14 minor dimensions: Joy, Sexual Excitement, Love, Anger, Sadness, Fear, Altered Body Image, Altered Time Sense, Altered Perception, Altered Meaning, and Amount (of Visual Imagery). Sheep showed greater increases than goats after IC. Again, assumptions for ANCOVA were met. No two-tailed ANCOVA tests results were significant, except for Fear (marginally significant) and Altered Body Image (significant) (see Table 2).

- (iii) *Interaction effects between the two factors regarding scores on the DVs were checked as sheep and goats may respond differentially to PCI changes.* Wilks'  $\lambda = 0.83$  (partial  $\eta^2 = 0.17$ ), and the multivariate test was not significant,  $F(12, 85) = 1.45$ ,  $p = 0.166$ . There was only one significant sheep–goat interaction effect on a major dimension; Rationality,  $F(1, 98) = 4.19$ ,  $p = 0.043$ , partial  $\eta^2 = 0.04$ . This effect was very weak. There was only one significant sheep–goat interaction effect on a minor dimension: Vividness,  $F(1, 98) = 4.19$ ,  $p = 0.043$ , partial  $\eta^2 = 0.04$ ; also very weak.

*Post hoc analyses*

Although the direct-hit rate in the present study was 21%, we find hit rates have been above MCE for the IC treatment in all IC studies to date (see Table 3). The IC psi effect using the direct-hit measure in the redesigned (shorter) protocol ( $k = 5$ , where  $k$  is the number of choices in a trial) is on par with the earlier findings in IC studies that used the original (longer) procedure (where  $k = 4$ ). The shorter design tests precognition; the longer nominally tested clairvoyance.

TABLE 3.

*Imagery-Cultivation Studies (2009 to 2022): Direct-Hit Rates*

Study	IC condition	MCE	Hit rate (%) (Hits, <i>N</i> )	<i>p</i>	<i>Z</i>
Storm and Rock (2009b)	Voice/drum; 19 min.; <i>k</i> = 4	25%	34.5 (19, 55)	0.073	1.48
Rock et al. (2012)	Voice/drum; 19 min.; <i>k</i> = 4	25%	26.9 (14, 52)	0.426	0.16
Rock et al. (2012)	Voice only; 19 min.; <i>k</i> = 4	25%	29.4 (15, 51)	0.280	0.57
Rock et al. (2012)	Drum only; 19 min.; <i>k</i> = 4	25%	25.9 (14, 54)	0.489	0.31
Total			29.3 (62, 212)	0.089	1.35
Storm (2019a)	Voice/music; 9½ min.; <i>k</i> = 5	20%	23.7 (14, 59)	0.291	0.55
Storm and Goretzki (2021)					
– Unselected	Voice/music; 9½ min.; <i>k</i> = 5	20%	24 (24, 100)	0.189	0.88
– SE-Experiencers*	Voice/music; 9½ min.; <i>k</i> = 5	20%	26 (26, 100)	0.087	1.38
Storm (2022)	Voice/music; 9½ min.; <i>k</i> = 5	20%	25.5 (13, 51)	0.207	0.81
Present study	Voice/music; 9½ min.; <i>k</i> = 5	20%	21.0 (21, 100)	0.441	0.13
Total			23.9 (98, 410)	0.023	1.91

\*SE-Experiencers are those participants who were selected because they had experienced spiritual emergency (see Storm & Goretzki, 2020, 2021)

Table 3 shows the aggregate mean hit rate for the earlier studies is 29.3% (MCE = 25), which is marginally significant,  $p = 0.089$  ( $z = 1.35$ ; Stouffer  $Z = 2.52$ ,  $ES = 0.17$ ). For the later studies the aggregate mean hit rate is 23.9% (MCE = 20%), which is significant,  $p = 0.023$  ( $z = 1.91$ ; Stouffer  $Z = 3.75$ ,  $ES = 0.19$ ). Note that effect sizes ( $ES$ ) are similar in both IC designs, and are comparable (or even superior) to the range of ganzfeld  $ES$  values of 0.10 to 0.17 ( $N = 102$ ), or 0.07 to 0.22 ( $N = 29$ ; Cardeña, 2018, p. 667), or, more recently, 0.07 to 0.13 (see Tressoldi & Storm, 2021, p. 61).

## DISCUSSION

IC is theorized to elicit relaxation and induce imagination (i.e., cultivate psychic imagery), and thus increase psi effects. The present study sought to determine participants’ phenomenological experiences during IC. There were only a few significant effects found in the present study, but this is nevertheless

encouraging and we can still draw certain conclusions about the IC treatment and its effects, both psychological and parapsychological.

In the present study, direct hitting was low at 21% (H1), but previously reported hit rates have been higher, ranging up to 26% in the precognition ( $k = 5$ ) design (see *Post hoc analyses* section). And since effects are comparable to psi effects produced by the ganzfeld protocol (and free response generally; see Cardena, 2018), we maintain that the IC protocol is a time- and cost-effective free-response alternative.

In H2, the mean rank score for the present study of 2.87 was not significant, but it is actually only slightly worse than the mean rank reported by Storm and Goretzki (2021), which was significant at 2.84 given the very large sample ( $N = 200$ ). In fact, mean rank score has always been better than an MCE of 3.00 in the IC treatment. The sum-of-ranks score was significant (see H3). These results bode well for the IC design.

In H4, the sheep scored a 25.5% direct-hit rate, but the goats scored lower at 16.7%. However, the sheep tended to generate worse rank scores on average (2.88) than the goats (2.85). In neither case were the differences significant, which may be surprising given the considerable percentage difference of 8.8%, but not so surprising on mean rank scores given a mere 0.03 difference. Realistically, percentages imply a psi effect more so than ranks. On the issue of sheep and goats, and therefore relevant to paranormal belief, a positive and significant correlation was reported above for Sex and RASGS (see the Descriptive Statistics section). As also pointed out above, males tended to score like goats, and females tended to score like sheep. I draw attention to this correlation because Irwin (2009) has noted that women tend to endorse more paranormal belief items than men. In this sample, we should expect females to produce a higher hit rate than males. However, a post hoc check showed that females yielded a mere 20.5% hit rate (15 hits;  $n = 73$ ), whereas males yielded a slightly higher 22.2% (6 hits;  $n = 27$ ). Males also out-scored females on mean rank score, 2.59 and 2.97, respectively.

For H5, no new correlations replicated the correlations reported in Rock and Storm (2010), although one notable but marginally significant correlation may be worth reporting since the direct-hits/Altered-Perception correlation found by Rock et al. (2013) was effectively replicated as rank-scores/Altered-Perception in the present study (though the correlation is negative, it implies the same effect—better ranks tend to occur with larger increases in Altered Perception). The negative direct-hitting/Absorption correlation suggests participants scored better if they did not fixate on one specific element or image to the exclusion of potentially important others. The three minor dimensions correlating with rank scores were puzzling—scoring improved with *increases* in Anger, but with *decreases* in Vividness of imagery and Volitional Control. It seems ironic (or counterintuitive, or goes against theory) that rank scores would tend to improve when Vividness diminishes (one usually associates vividness with clarity). It is,



however, suggested that decreased Volitional Control (reduced control over one's actions) would reasonably tend to go with better ranks because the participant's physical space is secondary to the mental sphere, and more attention is given to the latter. We would also need to be prepared to discount the seemingly dubious correlations as due to multiple analysis, and replication is certainly necessary.

For H6, two factors came under investigation—the IC treatment, and sheep–goat effects—in relation to PCI dimensions. Ten 10 major and 10 minor dimensions were significantly associated with the IC treatment. These are listed in Table B1, and are largely to do with ASCs and experience. Thus we see that the IC protocol achieves those aims by using relaxation to minimize physiological responses and focus the mind, and guided imagery to cultivate mental images; the expected outcomes are evident primarily in significantly *increased* Altered Experience, Visual Imagery, and Altered State of Awareness, alongside *reduced* Self-Awareness, Volitional Control, and Arousal. These are major dimensions, but the significant minor dimensions reflect similar outcomes (e.g., increased Altered Perception and Altered Meaning, and increases in Amount and Vividness of imagery, but with *reduced* Absorption). Note that the significant differences observed in Table B1 that refer to shifts in ASCs may be due to the nature of the imagery produced by the participants. Future exploration may decide the issue.

Sheep–goat effects were also evident as significantly *increased* scoring for sheep on one major PCI dimension (Altered Experience) and one minor dimension (Altered Body Image). Sheep thus seemed more responsive (more sensitive or prone) than goats to the IC treatment, but only on these two dimensions. One reviewer of this article made reference to similar findings in a study by Simmonds-Moore et al. (2019). Under an effectively non-treatment ('sham') condition, Simmonds-Moore et al. found “believers scored higher than skeptics on some PCI dimensions [including Altered Experience and Imagery]”, and believers also “reported more ExEs [exceptional experiences] than skeptics” (p. 44). While those ExEs can be likened to ‘imagery’ *per se* (and even associated with ESP), that does not mean the IC treatment is redundant or does not induce psi experiences, nor that those particular ExEs indicated psi (Simmonds-Moore et al. did not conduct an actual psi test). The IC treatment is a guided-imagery protocol designed to elicit paranormal responses expressly related to a psi target. Sheep also scored higher than goats on Fear (a minor dimension), albeit only marginally significantly higher. One explanation for lower scoring in goats on these three PCI dimensions is possibly to do with the fact that goats tended to be males, who are either less fearful than females, or less open about their fears than females (Fredrikson, 1996; McLean & Anderson, 2009), less concerned about body image, and resistant (even reactant) to experiences that diverge from what they perceive as normal (see Storm, 2019a, 2019b).

These findings have somewhat informed our understanding about imagery cultivation. There are 26 PCI sub-dimensions, and a majority of them are

associated with the IC treatment. Only a few of them are actual correlates of psi effects, but these may be the result of multiple analysis, though it seems logical to assume that rank 1 hits are more likely to be identified if absorption is reduced. Still on the psi effect—ostensibly precognition—the best indicator of its presence was the significant sum-of-ranks statistic. However, direct hitting has always been considered a conservative measure, and thus makes a demand on participants that can be difficult to meet. Furthermore, those participants were primarily psychology students, who are noted for being poorer than other types of participants at producing psi effects. Nevertheless, the more sensitive rank score (though not significant in the present study), is still on par with previous findings in studies using the IC protocol. Note that all significant findings in the present study are tentative pending future replication.

*lance.storm@adelaide.edu.au*

LANCE STORM

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## APPENDIX A

Pre-recorded instructions, adapted from Harner (1990). The soundtrack is available from the author: lance.storm@adelaide.edu.au.

*[Relaxing background tones for the entire 9 minutes and 35 seconds]*

- Visualize an opening into the earth that you remember from some time in your life.
- It can be an opening that you remember from your childhood, or one you saw last week, or even today.
- Any kind of entry into the ground will do. It may be a hole made by a burrowing animal, a cave, a hollow tree stump, a spring, or even a swamp.
- It can even be a man-made opening.
- The right opening is one that really feels comfortable to you, and one that you can visualize.
- Spend a couple of minutes seeing the hole without going in it. Note its details clearly.

*[2 minutes with continued background tones; no voice]*

- Visualize your opening into the earth ... [5 second pause] ... enter it ... [5 second pause] ... and begin the journey. Are you ready? OK, here we go.
- Go down through the opening and enter the tunnel ... [5 second pause] ... At first the tunnel may be dark and dim ... [5 second pause] ... It usually goes underground at a slight angle, but occasionally it descends steeply ... [5 second pause] ... The tunnel often bends ... [5 second pause] ... Now continue this journey down the tunnel until I give you further instructions.

*[3 minutes with continued background tones; no voice]*

- You are now reaching the end of the tunnel ... [10 second pause] ... you will see a set of doors ... [10 second pause] ... now visualize the doors in front of you ... [10 second pause] ... Now push open the doors ... [10 second pause] ... Now visualize a photographic image before you ... one that you will see later on the computer monitor [20 second pause] ... Imagine the photograph appearing on the computer monitor ... [20 second pause] ... Study the photograph in all its detail ... [20 second pause] ... Remember this information for later.
- The journey is now almost over ... [10 second pause] ... come back up through the tunnel ... [5 second pause] ... The session will conclude with a ringing bell sound to signal that the journey is over. [10 second pause] ... [bell rings]

## APPENDIX B

TABLE B1.

Mean Differences on Major/Minor PCI Dimensions (Before and After IC)

PCI dimension (Major and Minor)	Before IC		After IC		$F^*$	$p$	$\eta^2$
	$M$	$SD$	$M$	$SD$			
<b>Positive Affect</b>	2.36	1.09	2.87	1.14	23.65	<0.001	0.19
Joy	2.70	1.13	3.39	1.51	24.95	<0.001	0.20
Sexual Excitement	1.64	1.15	1.83	1.30	1.93	0.168	0.02
Love	2.73	1.49	3.41	1.53	18.31	<0.001	0.16
<b>Negative Affect</b>	2.05	1.12	2.20	1.16	1.58	0.212	0.02
Anger	1.92	1.15	1.98	1.25	0.23	0.630	0.01
Sadness	2.19	1.29	2.37	1.31	1.55	0.216	0.02
Fear	2.04	1.32	2.26	1.50	1.70	0.195	0.02
<b>Altered Experience</b>	2.61	0.92	3.72	0.95	95.02	<0.001	0.49
Altered Body Image	2.99	1.07	3.96	1.22	40.74	<0.001	0.29
Altered Time Sense	2.88	1.15	4.33	1.22	94.17	<0.001	0.49
Altered Perception	3.47	0.54	3.63	0.72	4.33	0.040	0.04
Altered Meaning	2.45	1.08	3.28	1.16	41.08	<0.001	0.30
<b>Visual Imagery</b>	3.58	1.05	4.99	1.30	86.33	<0.001	0.47
Amount	3.41	1.42	5.36	1.37	114.63	<0.001	0.54
Vividness	3.75	1.09	4.63	1.45	28.47	<0.001	0.23
<b>Attention</b>	4.79	0.85	4.69	1.04	0.65	0.421	0.01
Direction	4.59	1.01	4.95	1.18	5.13	0.026	0.05
Absorption	5.09	1.14	4.30	1.39	26.94	<0.001	0.22
<b>Self-Awareness</b>	5.17	0.83	4.65	1.30	14.29	<0.001	0.13
<b>Altered State of Awareness</b>	2.34	1.04	3.87	1.30	87.43	<0.001	0.47
<b>Internal Dialogue</b>	4.27	1.67	3.87	1.98	3.98	0.049	0.04
<b>Rationality</b>	5.17	1.03	4.52	1.25	21.83	<0.001	0.18
<b>Volitional Control</b>	4.91	1.07	4.17	1.19	26.58	<0.001	0.21
<b>Memory</b>	4.90	1.15	5.37	1.25	12.61	<0.001	0.11
<b>Arousal</b>	3.46	1.35	2.81	1.49	17.14	<0.001	0.15

\*  $df1 = 1; df2 = 98$ . There are 26 tests in total, and 20 (77%) are significant. Applying the 5% rule, this would mean we could expect at least 1.3 test results (realistically one, but no more than two) to be significant by chance alone.