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Adam J. Rock
University of New England

Lance Storm
University of Adelaide

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Cover Page Footnote

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Shamanism, Imagery Cultivation, and Psi-Signal Detection: A Theoretical Model, Experimental Protocol, and Preliminary Data

Adam J. Rock

University of New England
Armidale, NSW, Australia

Lance Storm

University of Adelaide
Adelaide, SA, Australia

Historically, transpersonal experience has been linked to paranormal or anomalous experience (i.e., psi, such as telepathy, psychokinesis, clairvoyance). In parapsychology, the *Ganzfeld* (i.e., a homogeneous visual and auditory field) is arguably the most widely used ostensibly psi-conducive technique. However, one area of shared interest in parapsychology and transpersonal psychology is *shamanic experience* (see Daniels, 2005). Based on anthropological and parapsychological claims concerning alleged psi effects during shamanic practices, we (Storm & Rock, 2009a) proposed an *imagery cultivation* (IC) model, which encourages ostensibly psi-conducive cognitive activity during a shamanic-like journeying procedure rather than the mental quietude promoted by the Ganzfeld noise-reduction model. In this paper we outline our IC model and describe an experimental protocol designed to test that model. Our recent empirical tests of the model (Rock, Storm, Harris, & Friedman, 2012; Storm & Rock, 2009b) are also reviewed. Finally, various directions for future research are proposed.

Keywords: *Ganzfeld, imagery cultivation, parapsychology, psi, shamanic-like journeying, shamanism*

Bem and Honorton (1994) stated that, “Historically, psi has often been associated with meditation, hypnosis, dreaming, and other naturally occurring or deliberately induced altered states of consciousness” (p. 5). Arguably, the dominant methodological paradigm in this context is the *Ganzfeld* (“total field”), which, in a general sense, is a “homogeneous perceptual environment” (Bem, 1993, p. 102). More specifically, the *Ganzfeld procedure* is characterized by an undifferentiated visual and auditory field. The visual field is induced when the percipient views a red light through halved translucent ping-pong balls. In contrast, the auditory field is created when the percipient is exposed to stereophonic monotonous hissing referred to as *white* or *pink noise* (Bem, 1993).

The Ganzfeld philosophy is underpinned by what is referred to as the *noise reduction model* (Honorton, 1974, 1993). This model conceptualizes psi (i.e., paranormal effects, such as telepathy, clairvoyance, psychokinesis) as a weak cognitive signal usually masked by internal cognitive and external “noise.” Theoretically, by modifying the “signal-to-noise ratio” (i.e., reducing the noise), using the Ganzfeld procedure, the presumed psi information could be better detected. Consequently, as a stimulus condition whereby a “sender” (agent) is

instructed to “psychically communicate” (Milton & Wiseman, 1999, p. 387) a target picture or movie-film to an isolated “receiver” (percipient) who is exposed to *homogeneous sensory stimulation*, the Ganzfeld is typically regarded as inducing a psi-conducive¹ altered state of consciousness (ASC).²

The question has been posed, “Do ostensibly psi-conducive stimulus conditions such as the Ganzfeld actually facilitate psi?” In response to that question, Braud (2005) has noted that:

it is not yet clear to what extent any psi manifested in such conditions might be attributable to psi-enhancing properties of the conditions themselves or to various sampling, demand characteristics, or experimenter effects. In addressing this issue, much more trenchant analyses seem to be in order, rather than taking it for granted that these conditions actually *facilitate* psi. (p. 48)

Scimeca, Boca, and Ianuzzo (2001) have questioned the ostensible psi-conduciveness of the Ganzfeld. More specifically, they noted the failure of independent and neutral scientists to replicate statistically significant Ganzfeld results. Moreover, they reviewed three Ganzfeld meta-analyses and concluded

that the application of meta-analysis “to synthesize and explain the results of this area of research has been flawed by a misinterpretation of its indices” (p. 13). Consequently, it may be useful to empirically test other stimulus conditions that are ostensibly psi-conducive. In this context, it is noteworthy that psi effects associated with shamanic practices have been reported extensively in the anthropological and psychological literature (e.g., Krippner, 1984; Nelson, Jahn, Dunne, Dobyns, & Bradish, 1998; Nelson & Radin, 2003; Saklani, 1988). The discussion will return to this theme later after a definition of the term *shamanism* has been offered.

What is Shamanism?

The key definitional elements of the term shamanism have been a subject of much debate amongst scholars (Silverman, 1969). In an early attempt at operationalization, Boyer, Klopfer, Brawer, and Kawai (1964) asserted that a shaman “refers only to those individuals who arrogate to themselves supernatural power and who are accorded the shamanistic status by their cultural mates” (p. 173). However, Klopfer and Boyer (1961) contended that due to variability regarding the opinions and values of societal members over time, it is often problematic distinguishing between shamans and practitioners who are devoid of supernatural abilities yet diagnose and treat illnesses with culturally sanctioned rituals and medicines. In comparison, pseudo-shamans may be defined as “persons who are accorded the status but themselves deny possession of power, or group members who claim to be shamans but who are disbelieved by other members of their society” (Boyer et al., 1964, p. 173).

In contrast, Dobkin de Rios and Winkelman (1989) defined shamans as “those practitioners of ecstasy in hunting and gathering societies of the world who utilize trance states and engage in healing and divination” (p. 2). The preceding definition locates the shaman in a specific cultural milieu. Nevertheless, “trance states” may be criticized as a general term that fails to denote a precise phenomenological content.

Moreover, the fundamentals of Hultkrantz’s (1973) definition of shamanism have been clearly demarcated by Wright (1989) as follows:

(1) “The shaman establishes contact with the supernatural world” (Hultkrantz, 1973, p. 31). Many scholars (e.g., Eliade, 1964; Heinze, 1991; Ripinsky-Naxon, 1993) concurred that “contact” occurs via ASCs, “particularly those ASCs involving *ecstatic journeying*, (i.e., *soul flight* or *out-of-body experience*)” (Krippner, 2002, p. 966, emphasis

in original). In shamanic cosmology, the “upper world” and “lower world” (Heaven or Sky, and the Underworld or Land of the Dead, respectively; Doore, 1989) intersect with the Middle World (Earth; Harner, 1987).³

(2) “The shaman is the intermediary between the human group and the supernaturals” (Hultkrantz, 1973, p. 33). The shaman performs a social-role function by entering a shamanic state on behalf of the social group and subsequently interpreting the phenomenological content of that state for the benefit of his or her community (Noll, 1983; Wright, 1989).

(3) “The shaman receives his inspiration from his guardian or helping spirits” (Hultkrantz, 1973, p. 38). While “journeying” through the “geography” of the Upper and Lower Worlds, the shaman may possess anthropomorphic and animalistic spirit guides that assist in his or her travels (Kalweit, 1988; Wright, 1989).

(4) “The shaman has ecstatic experiences” (Hultkrantz, 1973, p. 41). Shamanic states are often associated with high levels of physiological arousal (Walsh, 1995).

Eliade (1964) asserted that “a first definition of this complex phenomenon, and perhaps the least hazardous, will be: shamanism = ecstasy” (p. 4). Although Eliade (1964) recognized that shamanic states are ecstatic (rather than, for example, meditative), he neglected to consider the “social-role aspect” (Noll, 1983, p. 444) of the shaman. Peters and Price-Williams (1980) avoided this shortcoming by stating that the “only defining attribute is that the specialist enter into a controlled ASC on behalf of his community” (p. 408). However, Walsh (1989) criticized this definition as too broad because it includes any practitioners who “enter controlled altered states of consciousness” (p. 3) regardless of the specific phenomenological content of these states. Given the preceding discussion, a definition of shamanism is required that encapsulates both the distinct phenomenological content of shamanic states and the important role the shaman plays in his or her community. Thus, for the purpose of this paper we will define shamans as

socially designated practitioners who are capable of shifting their patterns of phenomenal properties to obtain information not ordinarily available to other members of their community, using that information to help and to heal community members as well as the community as a whole. (Rock & Krippner, 2011, p. 40)⁴

Shamanism and Psi

The aforementioned social-role function of shamanism typically involves the shaman accessing “information that is not ordinarily attainable by members of the social group that gave them privileged status” (Krippner, 2002, p. 962). For example, the shaman may wish to access information regarding the geographical location of a plentiful food source that will provide nourishment for the members of his or her social group. Shamans ostensibly access this information during ASCs using psi (e.g., clairvoyance; Rogo, 1987). For example, Krippner (1984) reviewed psi research concerning tribal shamans, and emphasized that shamans cultivate ASCs with the aim of attempting to “locate lost objects, foretell the future, communicate with someone at a distance, or heal an injured person” (p. 4).

Krippner (1984) concluded that, “the shamanistic tradition can yield information that will be helpful in solving some of the enigmas that currently exist in the understanding and control of psi” (p. 4). Indeed, numerous reviews (e.g., Rogo, 1983a, 1983b, 1987) of previous anthropological research suggest that shamanic techniques are associated with psi phenomena such as extrasensory perception (ESP; e.g., precognition). Furthermore, previous research has also investigated the effect of shamanic techniques on psychokinesis (PK). For example, Saklani (1988) tested the PK ability of five adult shamans in Garhwal Himalaya, and reported that the participants were “able to influence plant germination and protect seeds from the deleterious effects of saline” (p. 60).

It is useful to consider the aforementioned link between shamanism and psi in light of the fact that shamanic practices typically involve imagery cultivation (see Noll, 1985). Indeed, Walsh (1995) stated that shamanic practices induce cognitive activity involving mental imagery cultivation whereby the percipient is able to “enter and leave the ASC at will and . . . partly determine the type of imagery and experiences” (pp. 35-36). Walsh further argued that this “partial control of experience” is similar to the phenomenological effects of lucid dreaming and various imagery techniques used in a psychotherapeutic context (e.g., Jungian active imagination, Wolberg’s “Theatre Visualization Technique”). Similarly, Noll (1985) asserted that “shamanism is an ecstatic healing tradition which at its core is concerned with the techniques for inducing, maintaining, and interpreting the experience of

enhanced visual mental imagery” (p. 45). In addition, Peters (1989) emphasized the importance of imagery cultivation: “In shamanism, the key to the transpersonal is through visualization” (p. 129). Houran, Lange, and Crist-Houran (1997) provided empirical support for these contentions by analyzing the phenomenology of 30 narratives of shamanic journeying presented by Harner (1990). Houran et al. found that 93.3% involved some form of visual phenomena. Thus, it seems reasonable to conclude that shamanic techniques involve active cognitive processes or, more specifically, the cultivation, mastery and control of mental imagery.

The Imagery Cultivation Model

Storm and Rock’s (2009a) *imagery cultivation* (IC) *model* regards shamanic techniques and, similarly, shamanic-like⁵ techniques as being psi-conductive, with the alleged psi signal being somehow embedded in the cultivated imagery. More specifically, the IC model conceptualizes shamanic journeying as an active cognitive process of mental imagery cultivation that allows one to access the unconscious domain of the human psyche, which is considered a wellspring of psi images. Indeed, numerous scholars (e.g., Damery, 1997; Halifax, 1979; Layard, 1930; Overton, 1998) have argued that traveling to the various worlds within the shaman’s cosmos is interpretable as “symbolic journeys into the unconscious” (Downton, 1989, p. 75). For example, Downton (1989) asserted that the middle or terrestrial world is the barrier separating the unconscious (“lower world”) and conscious (“upper world”) elements:

Once the boundary between these realms is broken, the result is a dramatic change as unconscious contents flood into consciousness, transforming it and creating the sense of dismemberment—of being torn to pieces—widely regarded as the first step in the shaman’s rebirth. (p. 74)

Thus, the IC model considers mental imagery cultivation directed by shamanic-like journeying instructions to be the critical psi-conductive component of journeying rather than, for example, listening to monotonous drumming, ritualistic dancing, fasting, and so on. The model also notes that a pro-attitude for obtaining a psi-hit and knowledge that previous studies have produced statistically significant results are important psi-modifying variables (see Thalbourne, 2009). Indeed, the psi-permissiveness of psychological variables such as positive expectations and goal-related intentions

may play a psi-facilitating role in shamanic practices in general.

If, as the IC model stipulates, (1) specific forms of mental imagery cultivation allow the percipient to access psi signals; (2) the unconscious is a wellspring of psi images; and (3) as previously argued, shamanic journeying involves mental imagery cultivation that allows one to access the unconscious; then (4) the conjunction of (1), (2), and (3) may account, at least in part, for the previously stated link between shamanism and psi.

The IC model may be empirically tested using the standard picture-identification procedure (see Thalbourne, 1981), but includes additional IC steps: (i) the participant in the shamanic-like condition is instructed to lie on a padded floor-mat, placing a light-proof eye mask over his or her eyes; (ii) the participant is handed a light-proof target envelope containing a line-drawing randomly selected from a set of four pictures (he or she is instructed not to open it); (iii) the participant in the shamanic-like condition is required to cultivate specific shamanic-like visual imagery sequences (e.g., journeying to the “lower world” by visualizing entry into an opening in the Earth such as a “cave” or “animal burrow”) while listening to monotonous drumming; (iv) the participant (after the “journeying” session) describes vocally the line drawing that is concealed inside the envelope (mentation is recorded and read back to the participant in order to prompt his or her memory, thereby facilitating the ranking

process); (v) the participant, following conventional picture-identification techniques, ranks from 1 to 4 four pictures from a randomly compiled set of four pictures (i.e., original target picture + three decoys), following the preferential ranking method (see Thalbourne, 1981, pp. 55-56), whereby participants assign rank #1 to the picture “most likely” to be the target picture concealed in the target envelope, rank #2 to the picture “second most likely,” and so on, until all four pictures are ranked.

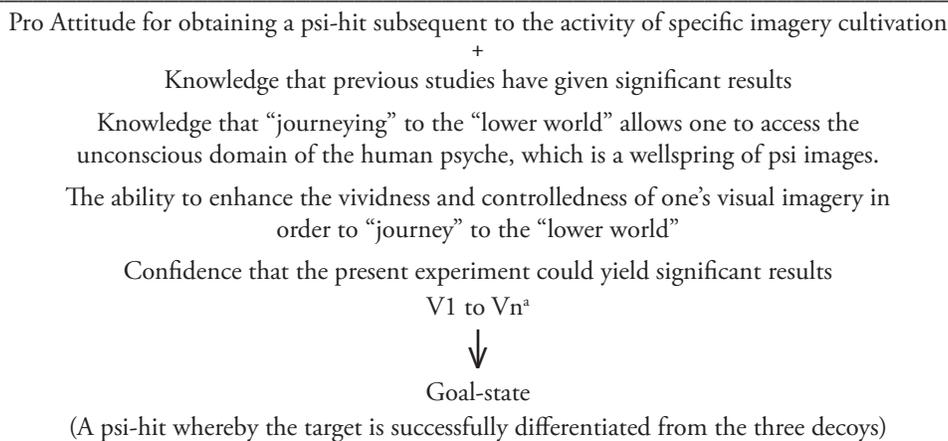
Note that participants in the control condition are also handed lightproof target envelopes, but they are not administered “journeying” instructions or exposed to monotonous drumming. From this point onwards, the control procedure follows that just described in the previous paragraph for picture ranking. Table 1 lists the necessary variables to obtain the goal-state (i.e., a psi-hit) according to the IC model.

The importance of our new and innovative experimental design is underpinned by some key differences compared to the standard Ganzfeld design. These are:

1. The IC model challenges the noise-reduction philosophy, which underpins the Ganzfeld. Ultimately it may facilitate a paradigm shift in parapsychology—a shift from the long-term focus on noise reduction to a possibly more rewarding emphasis on IC.

Table 1

Chart of Necessary Variables to Obtain the Goal-State According to the IC Model



^aFollowing Thalbourne’s (2009) psychopractic chart, “V1 to Vn” “is a ceteris paribus clause, referring to all necessary variables that in fact applied but that were not thought of by the experimenter and that were thus not mentioned explicitly in the chart” (p. 103).

2. The shamanic-like journeying protocol is far less complex to set up, and thus more economically viable than the Ganzfeld in terms of time and financial cost. In terms of the shamanic-like journeying procedure, there is no need for percipient/agent pairing, and testing can be done with more than one participant (i.e., two or three) in the same session provided they are randomly assigned to one and the same condition for that session. These protocols reduce the time taken up by briefing and debriefing, which can be done in small groups. We stress that we do not endorse group testing unless it specifically serves a purpose of a given researcher. For our IC model, we advocate independent (single-participant) testing wherever possible (see Utts, 1991), and researchers should limit themselves to testing only two or three participants at a time as we have done.
3. Following from this second point, we can see a shift from the working hypothesis that telepathy is the prime ESP modality tested in the Ganzfeld design, to the assumption that only clairvoyance may be operative in the IC design. In fact, to be accurate, most Ganzfeld studies conflate telepathy and clairvoyance (referred to as “general” ESP, or GESP) with no way of differentiating the two, whereas the IC design encourages pure clairvoyance because the participant has direct contact with the target, and does not depend on an agent. Telepathy cannot be ruled out of IC (e.g., the IC participant could telepathically read the mind of the target setter), but the IC design could be automated to eliminate this problem. As long as the Ganzfeld experiment uses a recipient and an agent, even the auto-Ganzfeld design cannot eliminate the GESP assumption whereas an auto-IC design would eliminate the GESP assumption.

Recent Tests of the IC Model Using Shamanic-like Techniques

In the first empirical test of the IC model, Storm and Rock (2009b) randomly assigned non-shaman participants ($N = 108$) to one of two conditions: (1) a control condition ($n = 53$) consisting of sitting quietly with eyes open; or (2) a treatment condition ($n = 55$) that involved shamanic-like journeying instructions followed by 15 minutes of monotonous drumming (8 beats per second, or b.p.s.).⁶ Participants were required to describe

verbally, and then rank, a randomly selected concealed line drawing, which they held throughout the condition. The direct hit rate was significant at 34.5% (where $P_{MCE} = 25\%$) in the shamanic-like condition, but the hit rate for the control condition was below chance, 22.6%. The direct hit effect for the treatment group (i.e., 34.5%) was comparable to the mean effect sizes reported in the major Ganzfeld meta-analyses (e.g., Bem & Honorton, 1994).

Storm and Rock’s (2009b) procedure requires that controls do not (i) lie down, (ii) close their eyes, (iii) wear eye masks, (iv) follow the visualization instructions, or (v) listen to monotonous drumming, but these are all integral components of Harner’s (1990) journeying method. Consequently, Rock and Storm (2010) asserted that matching treatment with control on any of these components would be unwise because it would potentially contaminate the control.⁷ Indeed, there may be, for example, additive effects between the various components of Harner’s (1990) method, and it is currently unclear which, if any, components are psi-conductive (see Fig. 1).

In a second study (Rock, Storm, Harris, & Friedman, 2012), we decided to test variations of the IC protocol to locate possible specific sources of the psi effect. The three variations of the IC conditions were: (i) Voice/Drum (the standard IC protocol consisting of exposure to shamanic-like journeying instructions coupled with monotonous drumming), (ii) Voice only, and (iii) Drum only.

Participants in the Voice/Drum condition produced a positive hit rate of 26.9%; participants in the Voice condition produced a positive hit rate of 29.4%; and participants in the Drum condition produced a positive hit rate of 25.9%. None of these hit rates were statistically significant.⁸ As expected, the control condition produced a non-significant below-chance hit rate of 23.3%.

To obtain a more up-to-date and reliable indication of the situation as it stands for our IC model, we combined the two sets of data (i.e., the data from Storm & Rock, 2009b, and the data from Rock et al., 2012). For the combined shamanic-like group ($N = 107$), direct hits were above chance at 30.8%; however, the statistic did not reach significance ($p = .101$, one-tailed). The corresponding small effect size ES (where $ES = z/\sqrt{n}$) of 0.13 equates with the mean ES for a 10-study Ganzfeld database reported by Bem, Palmer, and Broughton (2001) in their meta-analysis. This ES of 0.13

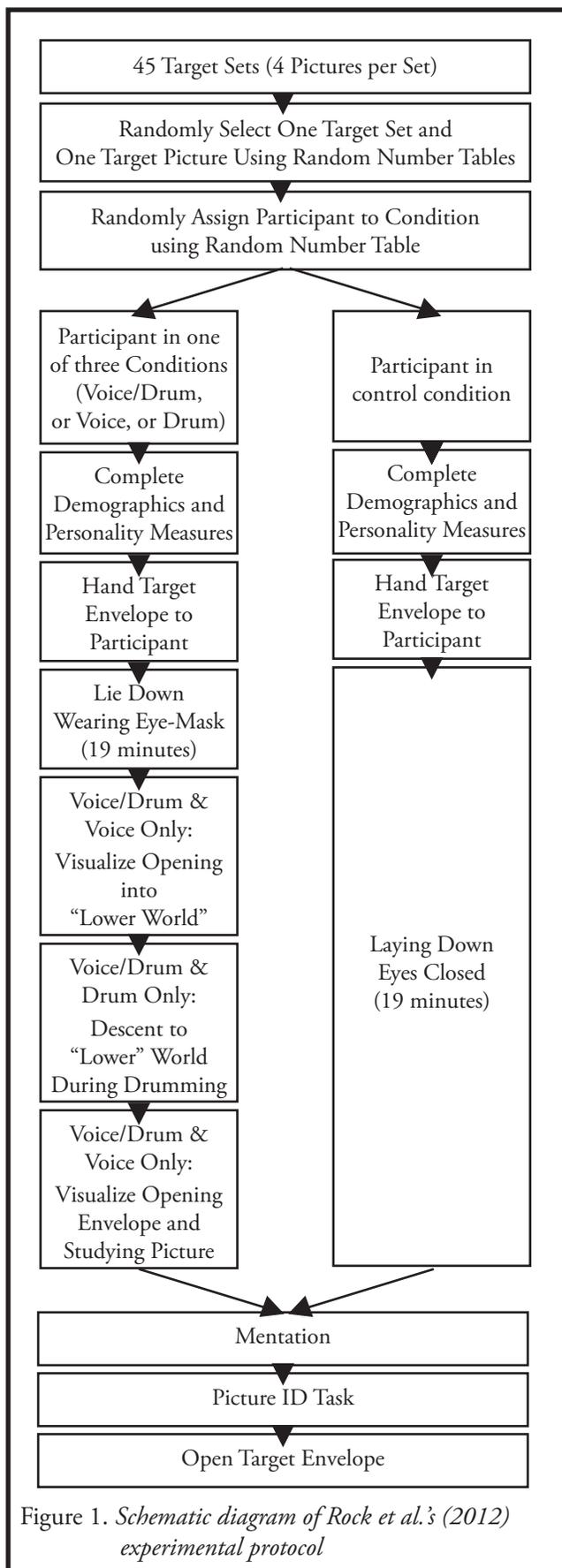


Figure 1. Schematic diagram of Rock et al.'s (2012) experimental protocol

is also comparable to the ES of 0.16 for the most recent 20-study Ganzfeld database reported by Tressoldi, Storm, and Radin (2010; see Table 2).

In stark contrast, for the combined Control group ($N = 96$), direct hits were below chance at 22.9%, and the result was not significant. When the direct-hit performances for the two groups (i.e., shamanic-like and control) were compared, the difference approaches significance, $\chi^2(1, N = 203) = 1.61, p = .106$ (one-tailed). These findings lend some support to our hypothesis that our IC model rivals the Ganzfeld paradigm.

Future Research

The findings of Storm and Rock (2009b) and Rock et al. (2012) suggest numerous avenues for future research. For example, if the IC model is correct regarding its stipulation that “journeying” to the “lower world” allows one to access the unconscious domain of the human psyche, which is a wellspring of psi images, then it is the “lower world” that is the psi-conductive shamanic cosmological destination rather than the “upper world.” Future research using the IC procedure might experimentally manipulate the cosmological destination and comparatively analyze psi-hit rates. Second, if the IC model has correctly identified the percipient’s ability to enhance the vividness and controlledness of his or her visual imagery in order to “journey” to the “lower world” as a necessary variable to obtain a psi-hit, then it may be prudent to experimentally manipulate whether or not a participant receives mental imagery training prior to being administered a shamanic-like treatment and the picture identification task. Similarly, a non-equivalent groups design might be invoked whereby the psi-hit rates of qualified shamanic practitioners and a sample from the general population are compared. Finally, the efficacy of the IC model might be directly compared with the noise reduction model by implementing an experimental protocol that consists of IC, Ganzfeld, and control procedures.

Conclusion

While it is still too early to draw conclusions about the efficacy of our IC model, there is good evidence so far that the shamanic-like journeying technique may be at least as effective and efficient as the Ganzfeld procedure. Also, we cannot state for certain that the shamanic-like journeying condition facilitates psi any better than a control condition, though psi effects were stronger in the former condition (Rock et al., 2012; Storm & Rock, 2009b). For these reasons,

Table 2
Performance Comparisons: Five Independent Ganzfeld Meta-Analyses

Author (Year)	Studies	Hit %	π	ES	Mean z	p
1. Honorton (1985) ^a	28	35.0	0.62	0.24	1.25	.107
2. Bem & Honorton (1994)	10	32.2	0.59	0.61	2.89	.002
3. Storm & Ertel (2001) ^b	11	31.6	0.58	0.21	0.91	.181
4. Bem, Palmer, & Broughton (2001)	10	36.7	0.64	0.13	1.26	.104
5. Tressoldi, Storm, & Radin (2010)	20	31.6	0.59	0.16	1.00	.159

a. Cited in Bem and Honorton (1994); b. The z scores and effect sizes are adjusted from those given in Storm and Ertel's Table 1 (2001, p. 428).

and on the premise that parapsychologists can reach a greater understanding of paranormal functioning by investigating innovative theory-driven experimental designs that may reveal the nature of psi processes, we see good reason for further research using imagery cultivation techniques.

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Notes

1. The question of whether the Ganzfeld protocol does in fact induce a psi-conducive ASC is usually answered indirectly in two ways. First, Ganzfeld researchers make the reasonable and logical assumption that homogeneous sensory stimulation and relaxation necessarily and favorably help to alter the signal-to-noise ratio (i.e., the psi signal is *enhanced*). Second, and as a consequence of this claim, the subsequent assumption is made that, based on the Ganzfeld meta-analyses, the Ganzfeld design demonstrates consistent, significant, and relatively higher effect sizes compared to its closest parallel, the free-response design, which does not feature an ASC (for comparisons of Ganzfeld with free-response, see Storm & Thalbourne, 2000; Storm, Tressoldi, & Di Risio, 2010).
2. It is perhaps noteworthy that Rock and Krippner (2012) argued that “altered states of consciousness”

may be more accurately described as “altered states of phenomenology.”

3. However, it is noteworthy that Rock and Krippner (2008) asserted that:

it would be an oversimplification to assume that all shamanic traditions equate the “lower world” with the land of the dead, and the “upper world” with “sky.” For example, Lepp (2004) stated that Mongolian shamans “travel to the Lower World to talk with the dead” (p. 218) but Na-hki and Moso shamans (in the Tibet area) believed that souls should “rise to heaven.” (p. 26)

4. Rock and Krippner (2011) stated that:

This definition begins to demystify shamanism, because the definition is operational; that is, each term it uses can be observed and, to some extent, measured. Hence, the definition does not use such terms as “upper world,” “spirits,” “power animals,” or the like. In contrast, many other definitions are mystified because they use, for example, the term “spirits,” which we would consider a “hypothetical construct,” or perhaps a “social construct” (or both). (p. 40)

5. The vast majority of empirical research concerning shamans has been anthropological and, thus, utilized non-experimental methodologies (e.g., naturalistic observation). However, there has been a recent trend towards investigating experimentally the effect of “shamanic-like” stimulus conditions on non-shamans (e.g., university students; Rock, 2006, 2010; Rock, Baynes, & Casey, 2005; Rock, Casey, & Baynes, 2006; Rock, Abbott, Childargushi, & Kiehne, 2008; Rock, Wilson, Johnston, & Levesque, 2008; Woodside, Kumar, & Pekala, 1997). Rock, Abbott, Childargushi, and Kiehne (2008) suggested that, “techniques may be conceptualised as ‘shamanic-like’ insofar as they bear some relation to shamanic techniques and yet depart from what may properly be called shamanism” (p. 80). For example, drinking ayahuasca in order to descend to the “lower world” and retrieve a tribal member’s “soul” may be considered a shamanic technique, while recreationally using ayahuasca to produce purported alterations in consciousness is merely “shamanic-like.”

6. Monotonous drumming at 8 b.p.s. for 15 minutes was used in Storm and Rock's (2009b) study because Rock et al. (2005) found that that it was associated with a statistically significantly higher number of ostensibly shamanic journeying images reported by non-shamans compared to a control condition, whereas, for example, 4 b.p.s. for 10 or 15 minutes and 8 b.p.s. for 10 minutes were not. We acknowledge that Harner (1990) recommends a drumming tempo of 205 to 220 beats-per minute (< 4 b.p.s.). However, we also note that Rock et al.'s findings suggest that a more rapid tempo may be required to elicit shamanic-like experiences in non-shamans.
7. Storm and Rock (2009b) further argued that

a control condition consisting of sitting quietly with eyes open has been proposed here because this particular stimulus condition has repeatedly demonstrated phenomenological effects consistent with ordinary waking consciousness in previous experimental studies (see, for example, Pekala, 1991). (p. 21)
8. Rock et al. (2012) noted that

it is prudent that experimenters be mindful of possible decline effects in their studies as these are common in parapsychology (Bierman, 2001). We accept that testing 200 participants might take its toll on even the most ardent lab experimenter, and perhaps not surprisingly, it was claimed by the third author (KH), who was also the sole experimenter who tested our participants in the lab, that her motivation declined over the course of the experiment. Also, about half-way through the experiment, she admitted (post-testing) to taking a liking to the drum condition, although this preference abated towards the end of the study. Although largely anecdotal, we tested for general trends in our data to see if there were indications of declines, or any other unusual performance biases. We split the data for each of the four conditions into four sub-groups thus forming 16 groups, and found that the direct-hit percentages were quite wide ranging, but there were no significant trends. Only one out of 16 sub-groups (the drum condition) produced a significant hit-rate of 57.1% ($p = .02$), which was in the third quartile—the four hit rates

deviated significantly from chance, $\chi^2(3, N = 54) = 10.67, p = .014$ (two-tailed). Applying the five-percent rule, we might expect 1 in 20 tests to be significant by chance so that this result may be a chance outcome of no special import.

Appendix A Instructions to Participants

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-minute pause]

When the drumming begins, 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.

[Drumming begins.]

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 sometimes appears ribbed, and often it bends ... [5 second pause] ... Occasionally one passes through the Tunnel so fast it is not even seen ... [5 second pause] ... In following the Tunnel you may run up against a natural wall of stone or some other obstacle ... [5 second pause] ... When this happens, just go around it or through a crack in it ... [5 second pause] ... If this fails, simply come back and try again ... [5 second pause] ... Now continue this journey down the Tunnel until I give you further instructions.

[Approx. 9 minutes of drumming
without accompanying instructions]

You are now reaching the end of the Tunnel ... [15 second pause] ... you will see a set of doors ... [15 second pause] ... now visualize the doors in front of you ... [15 second pause] ... Now push open the doors ... [15 seconds] ... Now visualize your envelope before you ... [30 second pause] ... Imagine opening the envelope and look at the picture ... [1 minute pause] ... Study the picture in all its detail ... [1 minute pause] ... Remember this information for later.

The journey is now almost over ... [15 second pause] ... The drum tempo will now become very rapid for the next half a minute to accompany you on your return journey ... [5 second pause] ... come back up through the Tunnel ... [5 second pause] ... The session will conclude with four sharp strikes of the drum to signal that the journey is over.

Appendix B Statistical Procedures to Test Psi-hitting

Direct Hits

Given that the IC model constitutes a new paradigm, there was no precedent we could use to select an appropriate test to analyze our data. Consequently, we opted to follow Honorton's (1985) advice that the direct hits measure provides a more "conservative" result (p. 54) relative to similar measures. Thus, we decided on direct hits as our measure of choice. Using a conservative measure may seem a reasonable way to proceed, and direct hits is widely used in Ganzfeld studies; however, the validity of the direct hits measure rests partly on the assumption that psi is an "all-or-none" phenomenon (Hansen & Utts, 1987, p. 322). The statistical significance of a direct hit rate may be tested using Rosenthal and Rubin's (1989, p. 334) Formula 4 to calculate a z statistic:

$$Z = \frac{N^{1/2} (\pi - .50)}{\pi(1-\pi) / [P(1-P)]^{1/2}}$$

In addition, effect size may be calculated using the following formula: $ES = z/\sqrt{n}$.

An Alternative Psi Measure—Sum-of-Ranks

We note that it is "unclear just how ESP should be expected to manifest in free-response situations" (Hansen & Utts, 1987, p. 322). For example, if items in the target pool are very similar, and two such items happen to find their way by chance into a single target set, then target selection for a given participant may prove difficult. On this basis, the option of giving partial credit to a second (i.e., default) choice, or even third choice, might be adopted in deference to direct hits. With this caveat in mind, Storm and Thalbourne (2001) initially used the sum-of-ranks test using the sum of ordinal weighted ranks formula (see Solfvin, Kelly, & Burdick, 1978), whereas direct-hits testing was confined to post hoc analyses. Ultimately, Storm and Barrett-

Woodbridge (2007) planned the use of both tests, but only for comparative purposes in order to resolve conjectures about how psi might manifest. These two studies (Storm & Barrett-Woodbridge, 2007; Storm & Thalbourne, 2001b) did show that rank data could yield evidence about the phenomenology of psi that was not apparent in a single percent score (i.e., a direct hit rate).

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 $\sigma^2_M = N(R - 1)/12$. The 0.5 is the usual continuity correction and has sign opposite to that of $(M - U_M)$ " (Solfvin, Kelly, & Burdick, 1978, p. 99). Psi-hitting is indicated by a significant sum-of-ranks score that is lower (better) than $MCE = 2.50$. The Z score will be negative because U_M is greater than M .

About the Authors

Adam J. Rock, PhD, holds posts at the International Transpersonal Association, the Australian Institute of Parapsychological Research (President), the *International Journal of Transpersonal Studies*, *Anthropology of Consciousness*, and the *Australian Journal of Parapsychology*. He has published dozens of academic journals articles as well as numerous books.

Lance Storm, PhD, is the author of the books *The Enigma of Numbers* (2008) and *A Parapsychological Investigation of the Theory of Psychopraxia* (2010). He also has published numerous peer-reviewed journal articles, and edited/co-edited several scholarly volumes. He has been awarded the Parapsychological Association's Outstanding Research Contribution Award and the Frances P. Bolton Fellowship.

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