

# HYPNOTIZABILITY, ALTERATIONS IN CONSCIOUSNESS, AND OTHER VARIABLES AS PREDICTORS OF PERFORMANCE IN A GANZFELD PSI TASK<sup>1</sup>

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**ABSTRACT:** We examined how hypnotizability, dissociation, alterations in consciousness, belief in success, and previous psi experiences related to performance in a ganzfeld psi task. High ( $n = 14$ ) and low ( $n = 12$ ) hypnotizables participated in 2 sessions. The first included measures of dissociation and alterations in consciousness during ganzfeld, whereas the second consisted of a telepathy task with the percipient again in a ganzfeld setting. We hypothesized that high hypnotizability (perhaps interacting with dissociation), alterations in consciousness, expecting a successful psi performance, and previous psi experiences would predict successful psi performance. Percipients' belief of their own success in the experiment and their reports of previous psi experiences correlated significantly with psi  $z$  scores, but contrary to our hypothesis hypnotizability overall correlated negatively with performance on the psi task. However, psi  $z$  scores correlated strongly to moderately with experiencing an altered state and other changes in consciousness, but only for high hypnotizables. Although we did not find an overall interaction between hypnotizability and dissociation, we observed that at least a subgroup of high dissociative, high hypnotizables seemed to be accurate when they followed their "hunches" rather than their imagery.

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*Keywords:* psi, ganzfeld, hypnotizability, dissociation, altered states, expectations, psi experiences

The sensory homogenization procedure known as ganzfeld remains one of the most widely used techniques in parapsychological research (Bem & Honorton, 1994; Milton & Wiseman, 1999; Storm, Tressoldi, & Di Risio, 2010). It has been thought to facilitate the anomalous process of information or energy transfer known as psi (Bem & Honorton, 1994). Why ganzfeld may facilitate psi is a subject of debate, but a frequent hypothesis is that it induces a psi-conducive state of consciousness (e.g., Tart, 1978). Exposure to ganzfeld may produce various alterations in consciousness such as vivid imagery, mild time distortions, and alterations in emotion and somatosensory experiences (Tsuji, Hayashibe, Hara, & Kato, 2004; Wackermann, Pütz, & Allefeld, 2008; Vaitl et al., 2005). A variety of these alterations have correlated with psi performance (e.g., time distortion, body awareness changes, see Alvarado, 1998; Palmer, 1978). Perhaps the most consistent results were obtained by Sargent and colleagues across a number of studies in which performance in psi tasks correlated with self-

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reported shifts in states of consciousness (e.g., Sargent, 1980), but there was controversy regarding the quality of this research (Blackmore, 1987; Harley & Matthews, 1987; Sargent, 1987). Nonetheless, Palmer, Khamashta, and Israelson (1979) found a similar correlation between altered states of consciousness and performance, and Carpenter (2004) reported that reports of self-transcendence correlated with success in a ganzfeld task. A few studies have found unexpected negative correlations between psi and self-reported altered states (e.g., Parker, 1975). Palmer (1978) noted that these negative correlations tended to occur in studies with overall negative results, hypothesizing that altered states might be more relevant to psi magnitude than direction. A study in a non-peer-reviewed publication reported that score-hitting was significantly better in a ganzfeld (33.3%) than a nonganzfeld condition (18.5%) but that ad hoc measures of alterations in time and body sense did not correlate with psi performance (da Silva, Pilato, & Hiraoka, 2003).

An important consideration is that not everyone experiences noticeable alterations in consciousness during ganzfeld, but individual differences in responsiveness remain poorly understood (Wackermann et al., 2008). The most comprehensive and updated meta-analysis on ganzfeld psi research found clear support for anomalous cognition in ganzfeld and that selected participants (e.g., practitioners of meditation and believers in psi), relative to unselected ones, had a performance advantage only in the ganzfeld condition (Storm et al., 2010). This finding provides strong support to study individual responsiveness to ganzfeld stimulation and the potential mechanisms that may explain success in psi tasks.

Three main hypotheses have been posited to explain successful psi-hitting in ganzfeld: the noise-reduction model (Braud, 1978; Honorton, 1977), increase in expectancy effects (Braud, 1978), and that alterations in consciousness, especially among high hypnotizables, may induce an experience of interconnectedness with everything that may be conducive to psi (Cardena, 2005, 2010). Consistent especially with the first and third theories is literature supporting a link between successful psi and a variety of altered states and induction procedures that may produce them, such as meditation (Luke, 2011).

According to the noise-reduction model, the weak psi signal is more likely to breach consciousness when other competing information is reduced (cf. Baars, 2001). In ganzfeld, visual and auditory stimulation is maintained at a constant level and together with a relaxation induction it reduces sensory stimulation. According to the expectancy hypothesis, ganzfeld may work because experimenters and participants believe in it, a kind of placebo effect. Smith, Wiseman, Machin, Harris, and Joiner (1997) found a moderately strong correlation between expected performance and actual performance on a coin toss task (but see also Smith & Savva, 2008). In addition, a few studies have manipulated expectation of success and found differences in performance between high- and low-expectancy

groups (e.g., Taddonio, 1975). In a study by Honorton (1969) participants performed better on a psi task following hypnotic induction relative to a control condition, but they also had greater expectations of success during hypnosis. Thus, the results of his study could fit into any of the noise-reduction, expectation, or altered-state hypotheses. It is of course possible that these factors interact with each other. Hypnosis procedures may work because they induce alterations in consciousness, reduce sensory stimulation, and/or boost people's expectations about psi.

### **Hypnotizability, Dissociation, and Psi**

The monotonous external environment makes ganzfeld a favorable procedure for internally directed attention (Pütz, Braeunig, & Wackermann, 2006). An accompanying relaxation instruction makes it similar to a hypnotic induction, which typically involves suggestions for focusing attention and relaxing the body and the mind. The phenomenological effects of hypnosis (Cardeña, 2005), but only for high hypnotizables (Cardeña, Lehmann, Jönsson, Terhune, & Faber, 2007), are similar to those reported in ganzfeld (Rock, Abbott, Childargushi, & Kiehne, 2008; Tsuji et al., 2004; Wackermann, Pütz, Büchi, Strauch, & Lehmann, 2002). Hypnosis has been associated with successful performance on psi tasks, although an experimenter psi-effect may account for a large portion of the variance (Stanford & Stein, 1994). In sum, ganzfeld and hypnosis are akin as procedures, the phenomenological effects they induce, and perhaps their purported influence on psi. We therefore might expect a great deal of overlap in individual responsiveness to ganzfeld and hypnosis procedures, and that individual differences in hypnotic responsiveness may account for a significant proportion of the variance in ganzfeld psi outcomes.

Hypnotizability, the ability to respond to suggestions following a hypnotic induction, has rarely been measured in parapsychological research, but it has correlated with performance in some psi experiments (Palmer, 1978). Two studies conducted after Palmer's review failed to find a significant correlation between hypnotizability and psi. The first (May, Bányai, Vassy, & Faith, 2005) was a pilot experiment with some significant limitations in the psi procedure (May, personal communication, 2008). In the second (Sondow, 1986), not reported either in a peer-reviewed journal, hypnotizability did not predict performance in a ganzfeld psi-task, but no descriptive data on hypnotizability nor on its association with psi scoring were provided, making it impossible for the reader to evaluate the results thoroughly. A more recent study (Tressoldi & Del Prete, 2007) reported significant psi scoring in the first of two sessions and significant correlations between psi performance and the personality traits of absorption and transliminality, the first of which has been found to correlate with hypnotizability in a number of studies (Roche & McConkey, 1990).

Furthermore, despite the similarities between ganzfeld and hypnosis there is no guarantee that all of those who are highly hypnotizable will be also highly responsive to ganzfeld. This issue is related to the contemporary debate regarding heterogeneity in the high-hypnotizable population (McConkey & Barnier, 2004). There are a number of theories (e.g., Barber, 1999) and studies (e.g., Terhune & Cardena, 2010) proposing that high hypnotizables who are or are not also highly dissociative differ in important ways. In the context of parapsychology research (Cardena, Marcusson-Clavertz, & Wasmuth, 2009), hypnotizability alone did not predict performance on a precognition task, but when participants were also blocked according to high or low dissociation there was a significant difference between groups. Accordingly, if hypnotizability is used as a predictor of psi performance, dissociation and alterations in consciousness might be mediating or moderating variables.

### **Belief in Experimental Success and Reported Previous Psi Experiences**

The so-called sheep-goat effect proposes that belief that a psi experiment will be successful, and more particularly that the respondent will be successful in the specific study in question, correlates with psi-hitting. A meta-analysis showing a small significant effect across various studies supports this effect (Lawrence, 1993). Reported prior experience of putative psi phenomena has also been found to relate to success in ganzfeld psi tasks (Honorton, 1997; but see also Milton & Wiseman, 1999). It is relevant in this context that hypnotizability and dissociation correlate positively with reports of psi and anomalous experiences, especially when the traits occur jointly (Pekala & Cardena, 2000).

### **Our Study**

This study evaluated five hypotheses concerning our dependent variable, the participants' scoring of a target and three decoys in a ganzfeld telepathy protocol:

- (1) Believing that one will be successful in the psi task will correlate positively with psi performance.
- (2) Reported previous psi experiences will positively predict psi performance.
- (3) High hypnotizables will score significantly better than low hypnotizables.
- (4) Dissociation will mediate or moderate the effect of hypnotizability in psi scoring.
- (5) Alterations in consciousness will be significantly related to performance in the psi task and to hypnotizability.

We used multivariate analyses to evaluate the joint and independent contribution of the variables in our hypotheses.

## Method

### Participants

**Percipients.** We recruited individuals from a sample ( $N = 332$ ; 64% females, mean age = 25.26,  $SD = 6.94$ ) to which we administered a standardized measure of hypnotizability. Participants were undergraduate or recently graduated students in different disciplines, psychology being the most common. We then approached those who were high or low in hypnotizability and asked them if they would like to participate in a further experiment, and approximately 50% of those contacted agreed to participate. There were 4 males and 11 females among the high hypnotizables (highs), and 4 males and 10 females among the low hypnotizables (lows). The mean age was 22 years for highs ( $SD = 5.04$ ) and 23.14 for lows ( $SD = 3.21$ ). Each of the 29 participants completed a measure of dissociation and was designated as either high ( $n = 15$ ) or low ( $n = 14$ ) in dissociation. This yielded the following four groups; low dissociative/low hypnotizables (henceforth LD lows,  $n = 8$ ), high dissociative/low hypnotizables (HD lows,  $n = 6$ ), low dissociative/high hypnotizables (LD highs,  $n = 6$ ), and high dissociative/high hypnotizables (HD highs,  $n = 9$ ). Three participants (1 LD low, 1 HD low, and 1 LD high) completed the first session but dropped out from the second session, thus leaving us with a final sample of 26.

**Agents.** Each of the 26 percipients was asked to bring a person with whom he or she had a close connection to serve as an agent (12 males and 14 females, mean age = 23.27,  $SD = 5.44$ ). A majority of percipient-agent pairs were friends or acquaintances from the same class, and informal questioning revealed that often there was not a close emotional link within the pair. Four of the pairs were in a relationship and one pair was formed by relatives.

**Experimenters.** The roles of each experimenter are described in the Procedures section. Both authors/experimenters are generally supportive of the psi hypothesis about a number of phenomena, including telepathy, and have had direct or indirect experiences that could be interpreted as psi.

### Measures

All of the questionnaires and scales used have good psychometric properties. The Dissociative Experiences Scale (DES) is a self-report measure of dissociative experiences with 28 items (Bernstein & Putnam, 1986; Carlson & Putnam, 1993), and the Swedish version, the S-DES, also has good psychometric properties (Körllin, Edman, & Nybäck, 2007). Respondents indicate how often they have experienced each event on an

11-point scale from 0 to 100 percent. The mean of all ratings constitutes the individual outcome measure. Participants were designated as high (or low) in dissociation if their scores were above (or below) a cutoff value of 20, following various studies that suggest that the majority of people (that is, psychologically healthy individuals and those with nondissociative symptomatology) typically score less than 20 in this measure (for a review, see Cardena, 2008). The scale had good reliability in this sample (Cronbach's  $\alpha = .93$ ,  $M = 20.16$ ,  $SD = 11.76$ ).

The Harvard Group Scale of Hypnotic Susceptibility (HGSHS; Shor & Orne, 1962) is a group measure of responsiveness to hypnotic suggestions or hypnotizability. Participants indicate whether they responded to a given suggestion, and the scale consists of 12 items for which the score is the sum of all responses. Respondents that scored from 0 to 3 were designated as low hypnotizables, and those that scored from 9 to 12 were designated as high hypnotizables, the typical way of classifying hypnotizability in the literature.

The Phenomenology of Consciousness Inventory (PCI; Pekala, 1991) is a questionnaire about subjective experience completed in reference to a preceding stimulus condition. Each of the 53 items provides two opposite statements separated by a seven-point Likert-type scale. The PCI consists of two forms with the same items in alternate order and assesses 12 major dimensions of consciousness and 14 subdimensions. The dimensions (and subdimensions) are: positive affect (joy, sexual excitement, and love), negative affect (anger, sadness, and fear), altered experience (body image, time sense, perception, and meaning), visual imagery (amount and vividness), attention (directionality and absorption), self-awareness, altered state, internal dialogue, rationality, volitional control, memory, and arousal. Cronbach's  $\alpha$  indicated good reliability with our sample ( $\alpha = .82$  for Form 1, and  $\alpha = .74$  for Form 2).

A psi questionnaire was developed for our study. It consists of demographic questions and three additional items addressing respondents' attitude to and experiences of purported psi phenomena. The first item requires respondents to indicate how likely they think it is that the overall experiment will succeed in eliciting telepathy (henceforth "belief in experiment success"). The second asks how likely respondents think it is that they themselves (i.e., the percipient-agent pair) will succeed in eliciting telepathy in their own trial (henceforth "belief in individual success"). Each item is answered by marking a cross on a visual analog scale (0–100%). The third item requires respondents to report whether they have had prior psi experiences ("yes" or "no").

## **Setup**

The auditory homogeneity was created by playing "pink noise" (i.e., noise distributed uniformly by octave throughout the audio

spectrum, which sounds like the “static” between radio stations) through a set of headphones. Each participant adjusted the volume individually at the onset of the ganzfeld session, which remained fixed throughout the session. The visual stimuli consisted of two 40 W desk-lamps providing a red light at a distance of 60 cm. To ensure visual homogeneity, participants wore taped anatomically shaped halves of ping-pong balls (i.e., acetate hemispheres) over their eye orbits. The relaxation induction consisted of a recorded female voice giving suggestions to tense and then relax various parts of the body. The rooms that were used for the telepathy task were in separate buildings, and the percipients’ room was sound attenuated.

An automated ganzfeld procedure was used for this study. A java program was responsible for randomization, communication between agent-percipient computers, and recording of information. The program employs a random number generator known as SecureRandom and a built-in media player. The random number generator was tested before the experiment by running numerous simulations of distributions, none of which deviated from randomness. First, the program randomly chooses and presents the target clip on the agent computer screen. At the end of the ganzfeld session, it transmits the information to the percipient computer, which presents each of the four clips from the target set in a random order. The program requires the percipient to provide a unique rating for each of the four clips on a scale from 0 to 100. Immediate feedback is given after the ratings have been submitted. The pool consisted of 116 dynamic clips in 29 fixed sets that have previously been used in psi experiments (e.g., Roe, Sherwood, Farrell, Savva, & Baker, 2006).

## **Procedure**

High- and low-hypnotizable individuals had been previously screened by E. C. or another hypnotist with the HGSHS in groups of about 20 to 40, which is a common range for this measure. They were then asked to participate in two individual sessions each. Approximately 50% of those contacted agreed to do the experiment some 2–4 months after the initial hypnosis session (see Figure 1). The first session, conducted by D. C., was presented as a relaxation and awareness exercise. Participants completed a ganzfeld condition and a control (i.e., sitting quietly with closed eyes in a dark room) in a counterbalanced order. Each condition started with 10 min 30 s of relaxation instructions including looped water waves as background sound. Subsequently, participants provided thinking-out-loud reports while they experienced the ganzfeld or control condition for 20 min. Participants then completed a behavioral task related to mind-wandering during 7 min of the ganzfeld or control conditions. The mind-wandering and thinking-out-loud data will be reported elsewhere as they were part of a different project (Marcusson-Clavertz, Terhune, & Cardeña, under review). After

each condition was completed, participants completed the PCI in reference to it.

D. C. described the second session as a telepathy task, and each participant was encouraged to bring a person emotionally close to them. Participants received the S-DES, which they were asked to complete before the second session. A few participants forgot to bring the S-DES and instead completed it at the onset of the second session.

The second session started with participants arriving to the room that was to be used as the percipient room. They were greeted by D. C., who described the ganzfeld procedure and its generally positive results. Then they all walked to the second building to meet with E. C. and visit the agent room. Participants received refreshments and instructions, and were encouraged to remain open to any experience or impulse they may have and to remain focused on their experiences and, in the case of the agents, the video, rather than trying to use their logic or critical reasoning in the experiment. Then the percipients and D. C. returned to the ganzfeld room to start the task. Each participant completed the psi questionnaire, and then D. C. and E. C. synchronized the procedures with a phone call and started the autoganzfeld. In the first phase, percipients and agents listened to the same 10 min 30 s relaxation tape to induce a more similar experience in both. In the second phase, the agents watched a randomly chosen 1-min video clip repeatedly for 20 min. Meanwhile, the percipients provided thinking-out-loud reports during ganzfeld. As the sending phase was completed, the percipient computer presented four randomly ordered video clips. Percipients were instructed to rate each clip on the basis of how likely it was to be the target, and they were encouraged to do this by comparing each clip with their ganzfeld experience. After all clips had been played at least once, percipients rated each of the four clips and submitted the answer, and then immediate feedback was given by the computer. All participants and experimenters reunited and shared the results, with the experimenters mentioning that regardless of the results the participants had provided very valuable data and that the presence of psi cannot be determined by the outcome of a single session, whether positive or negative.

All participants provided informed consent. The experimenters remained masked about percipients' level of hypnotizability and dissociation until all data were collected. Percipients were compensated with a cinema ticket for each of their two sessions, whereas agents received one cinema ticket for their single session. Pairs that scored a hit on the psi task were compensated with two additional cinema tickets, a reward they were not told of in advance (in line with psi-mediated instrumental response, Stanford, 1990; personal communication, 2009). Participants did not receive any other form of compensation nor were they fulfilling any course requirement.



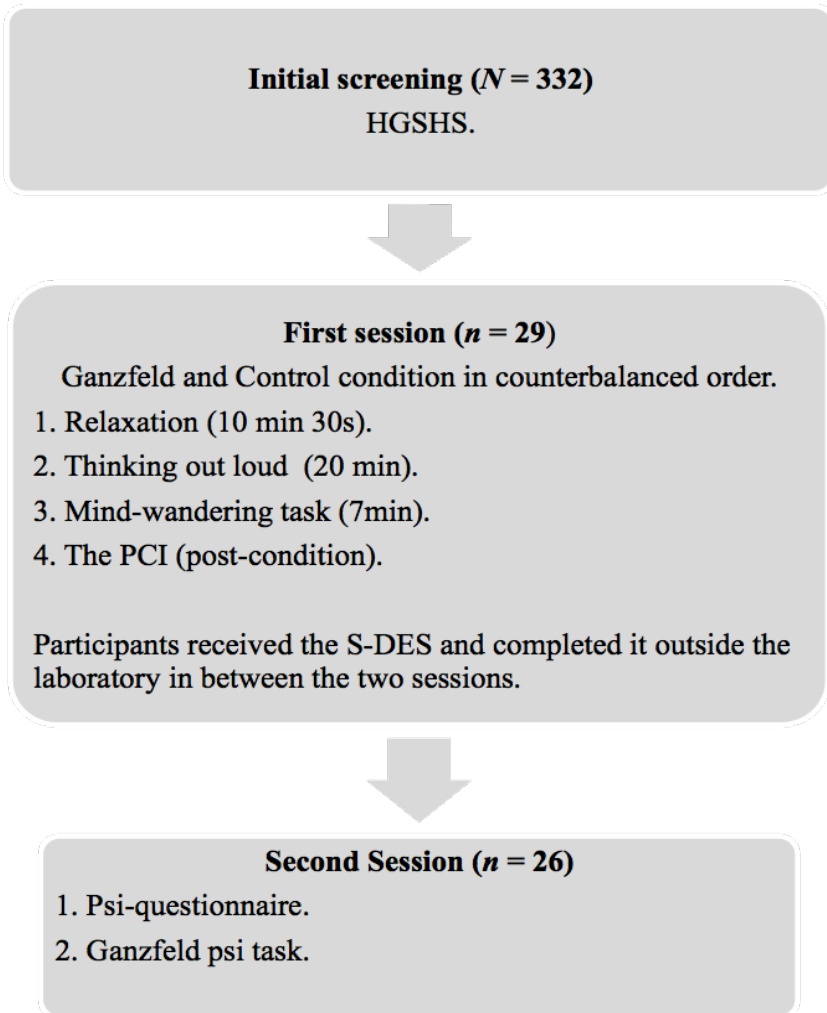


Figure 1. Experimental sequence

### Analyses

Following convention, the number of correctly identified targets (direct hits) was used as the outcome measure of psi in the overall sample ( $MCE = 0.25$ ). For the remaining analyses related to hypotheses-testing we used the more sensitive  $z$  scores as the DV (Stanford & Mayer, 1974; Stanford & Sargent, 1983). A  $z$  score (hereafter termed “psi  $z$  score”) was calculated by subtracting the mean score of all four ratings from the target score and then dividing this value by the  $SD$  for all four ratings. Thus,  $MCE = 0$  if the null hypothesis is true.

An ANCOVA was conducted for comparisons across groups. ANCOVAs have frequently been used in both experimental and non-experimental designs (Tabachnick & Fidell, 2007), and although they are only sensitive to linear relationships, they can increase the precision of the analysis (Keppel, 1982). All ANCOVA assumptions were satisfied according to the guidelines of Tabachnick and Fidell (2007).

Pearson product-moment correlations were used for correlating PCI scores from the first ganzfeld session with performance on the psi task in the second session. Within-subjects designs can suffer from biases related to order-of-testing (Poulton, 1973), which can reduce validity despite the use of counterbalancing. We therefore tested if order-of-condition (ganzfeld or control first) from the first session had an impact on ganzfeld PCI outcomes. None of the 12 ANCOVAs with hypnotizability and dissociation as IVs, order of conditions as covariate, and each of the PCI major dimensions as DVs yielded an effect for order-of-condition ( $F_s < 3.3$ ). We therefore report the correlations between PCI dimensions and psi  $z$  scores as they are, without controlling for order of conditions.

Product moment correlations and  $t$  tests were computed for other analyses; Mann-Whitney  $U$  tests ( $Z$  statistic) and Spearman's rank correlations were used if parametric assumptions were violated. All analyses related to our hypotheses were two-tailed with  $\alpha = .05$ .

## Results

### Overall Psi

Evaluating overall psi was not a target of this process-oriented research, but we calculated it nonetheless. Participants correctly identified the target in 7 out of 26 trials (27%), which does not deviate from  $MCE$  ( $p = .485$ , one-tailed). There were 8 second-ranks, 6 third-ranks and 5 fourth-ranks. Although there was a tendency for a correlation between percipients' age and psi  $z$  score,  $r(24) = .34$ ,  $p = .09$ , this correlation was likely caused by an outlier. Removing it yielded a nonsignificant correlation,  $r(23) = .27$ ,  $p = .19$ . No other age or gender variable correlated with psi  $z$  score or hypnotizability ( $p$ 's  $> .1$ ), and they were therefore not included in the remaining analyses.

### Expectations of Success and Prior Psi Experiences

Correlations between psi  $z$  scores and expectations of success were computed for both percipients and agents. Because there were two similar-worded questions (belief in experiment success and belief in individual success), a Bonferroni correction was used (adj.  $\alpha = .025$ ). Participants had a moderate belief in experiment success ( $M = 41\%$ ,  $SD = 19$ ), and individual success ( $M = 44\%$ ,  $SD = 22$ ), and percipients and agents did not significantly differ in their expectations. There was a moderate correlation

between percipients' belief in individual success and actual performance,  $r(24) = .50$ ,  $p = .01$ , and a nonsignificant positive correlation between their performance and their belief in experiment success,  $r(24) = .26$ ,  $p = .21$ . As for the agents, correlations between expectations and performance were close to zero ( $p$ 's  $>.7$ ).

Prior psi experiences were reported by 54% of the percipients and 77% of the agents. Percipients who reported previous psi had a positive psi  $z$  score ( $M = 0.32$ ,  $SD = 0.71$ ), whereas the remaining percipients had a negative psi  $z$  score ( $M = -0.27$ ,  $SD = 0.89$ ). This difference was significant ( $z = 2.06$ ,  $p = .040$ ). As for agents, there was no significant difference between those who reported previous psi experiences ( $M = 0.18$ ,  $SD = 0.84$ ) and those who did not ( $M = -0.38$ ,  $SD = 0.77$ ;  $z = 1.16$ ,  $p = .25$ ). No further analyses were done with the agents.

We then computed correlations for high and low hypnotizables separately. Table 1 shows the correlation matrix between the variables. Not surprisingly, beliefs about the success of the experiment and individual success were strongly correlated overall. Belief in individual success correlated with psi  $z$  scores for both groups. In contrast, prior psi experiences correlated with psi  $z$  scores only among high hypnotizables. There was no correlation between belief in individual success and prior psi experiences.

Table 1  
Correlation Coefficients for High ( $n = 14$ ) and Low Hypnotizables ( $n = 12$ )

	Group	1 Psi $z$	2 B. exp.	3 B. ind.	4 Pr. psi.	5 Diss.
1. Psi $z$ score	High	1				
	Low	1				
	Total	1				
2. Belief in experiment success	High	.36	1			
	Low	.29	1			
	Total	.26	1			
3. Belief in individual success	High	<b>.57*</b>	<b>.63*</b>	1		
	Low	<b>.62*</b>	.57	1		
	Total	<b>.50**</b>	<b>.66**</b>	1		
4. Prior psi experiences <sup>a</sup>	High	<b>.61*</b>	.50	.14	1	
	Low	.14	-.34	-.10	1	
	Total	<b>.41*</b>	.09	.01	1	
5. Dissociation score	High	.28	.10	-.22	.39	1
	Low	.31	.50	.45	-.24	1
	Total	.21	.38	.20	.15	1
6. Altered state in ganzfeld	High	<b>.74**</b>	.38	.53	.23	.22
	Low	-.10	.21	.35	-.27	.46
	Total	.33	<b>.40*</b>	<b>.52**</b>	.00	<b>.41*</b>

<sup>a</sup>All correlations with this variable are Spearman's rho.

\*  $p < .05$ , \*\*  $p < .01$

## Hypnotizability and Dissociation

The descriptive data for each group are given in Table 2. All groups had psi z scores close to zero, but LD highs had a noticeable negative score. To evaluate the specific effect of hypnotizability and dissociation while controlling for other significant variables, we conducted a 2 x 2 ANCOVA with hypnotizability (high vs. low), and dissociation (high vs. low) as between-subjects factors, psi z scores as the DV, and percipients' belief in individual success and prior psi experiences as covariates. There was a negative relationship between hypnotizability and psi performance,  $F(1,20) = 7.52$ ,  $p = .013$ ,  $\eta_p^2 = .27$ . Low hypnotizables had a marginally significant psi z score, 95% CI [0.01, 0.79], whereas highs had a suggestive negative psi z score, CI [-0.71, 0.04].

Dissociation did not correlate with psi z scores either by using mean scores (see Table 1) or groups in the ANCOVA,  $F(1,20) = 1.01$ ,  $p = .326$ ,  $\eta_p^2 = .05$ , although HD individuals had a slightly positive psi z score and LD a slightly negative one. Neither was there a significant interaction between hypnotizability and dissociation,  $F(1,20) = 1.47$ ,  $p = .240$ ,  $\eta_p^2 = .07$ . The two covariates were positively related to psi z scores, confirming the separate analyses in the preceding section:  $F(1,20) = 15.46$ ,  $p = .001$ ,  $\eta_p^2 = .44$  for belief in individual success and  $F(1,20) = 4.95$ ,  $p = .038$ ,  $\eta_p^2 = .20$  for prior psi experiences. An equation including percipient's level of hypnotizability, dissociation, belief in individual success, and prior psi experiences accounted for approximately 57% of the total variance in psi z scores,  $F(5,20) = 5.26$ ,  $p = .003$ . If dissociation, which was the only nonsignificant predictor, is excluded it yields an equation that accounts for 51% of the total variance.

Table 2  
*Psi z Scores Across Levels of Hypnotizability  
(Highs vs. Lows) and Dissociation (HD vs. LD)*

Group	<i>M</i>	<i>SD</i>
LD lows ( $n = 7$ )	.04	.82
HD lows ( $n = 5$ )	.33	.91
LD highs ( $n = 5$ )	-.50	.85
HD highs ( $n = 9$ )	.20	.82
Total ( $n = 26$ )	.05	.84

## Hypnotizability and Being in an Altered State

As Table 1 shows, the PCI scale measuring experience of an altered state in ganzfeld correlated significantly with beliefs in both the success of the experiment and individual success, and with dissociation. Psi  $z$  scores correlated strongly with this PCI scale among high hypnotizables,  $r(12) = .74$ ,  $p = .002$ , but not among lows,  $r(10) = -.10$ ,  $p = .75$  (see Figure 2). An  $r$ -to- $z$  transformation demonstrated that the correlations for highs and lows differed significantly ( $z = 2.37$ ,  $p = .018$ ). It is also of interest that there was no correlation between highs' psi  $z$  score and their sense of being in an altered state in the control condition,  $r(12) = .13$ ,  $p = .67$ . We also tested whether high hypnotizables' correlation between *altered state* in ganzfeld and psi  $z$  scores was mediated by expectations. A semipartial correlation, controlling for the influence of belief in individual success on psi  $z$  score, also yielded a significant relationship between *altered state* in ganzfeld and psi  $z$  score,  $sr(11) = .54$ ,  $p = .020$ . Inversely, when the influence of *altered state* in ganzfeld on psi  $z$  score was controlled for, the semipartial correlation between belief in individual success and psi  $z$  score was nonsignificant,  $sr(11) = .27$ ,  $p = .28$ . For low hypnotizables, however, it was instead belief in individual success that significantly predicted psi  $z$  score after semipartialing out the other variable,  $sr(9) = .66$ ,  $p = .017$ , for belief in individual success;  $sr(9) = -.40$ ,  $p = .19$ , for *altered state*. Finally, for the total sample, the analogous semipartials with psi  $z$  scores yielded only a significant effect for belief in individual success,  $sr(23) = .34$ ,  $p = .047$ ; *altered state*,  $sr(23) = .08$ ,  $p = .64$ . Thus, *altered state* in ganzfeld and belief in individual success contributed unique variance to psi  $z$  scores, and there was only a clear relationship between experiencing an altered state and psi performance for high hypnotizables.

## Other Consciousness Variables and the Psi Task

We estimated the correlations between psi  $z$  scores and all of the PCI major dimensions. Except for the *altered state* dimension already discussed, these analyses can be considered exploratory. The correlations between PCI major dimensions and psi  $z$  scores are reported in Table 3. For high hypnotizables, *altered experience* correlated positively with psi  $z$  scores, whereas there was no significant correlation between PCI dimensions and psi  $z$  scores for low hypnotizables. Follow-up analysis on the subdimensions of *altered experience* for high hypnotizables indicated that altered perception,  $r(12) = .65$ ,  $p = .01$ , and time sense,  $r(12) = .60$ ,  $p = .02$ , correlated significantly with psi performance, whereas changed *meaning* experiences correlated marginally,  $r(12) = .50$ ,  $p = .07$ , and altered *body image* was not significant,  $r(12) = .33$ ,  $p = .25$ . In the total sample there was a negative correlation between *self-awareness* and psi  $z$  scores. It is also worth pointing out that although they did not correlate significantly, various measures of ordinary rational thought (i.e., *rationality*, *volitional control*, *memory*, *internal dialogue*) tended to have negative correlations with psi  $z$  scores.

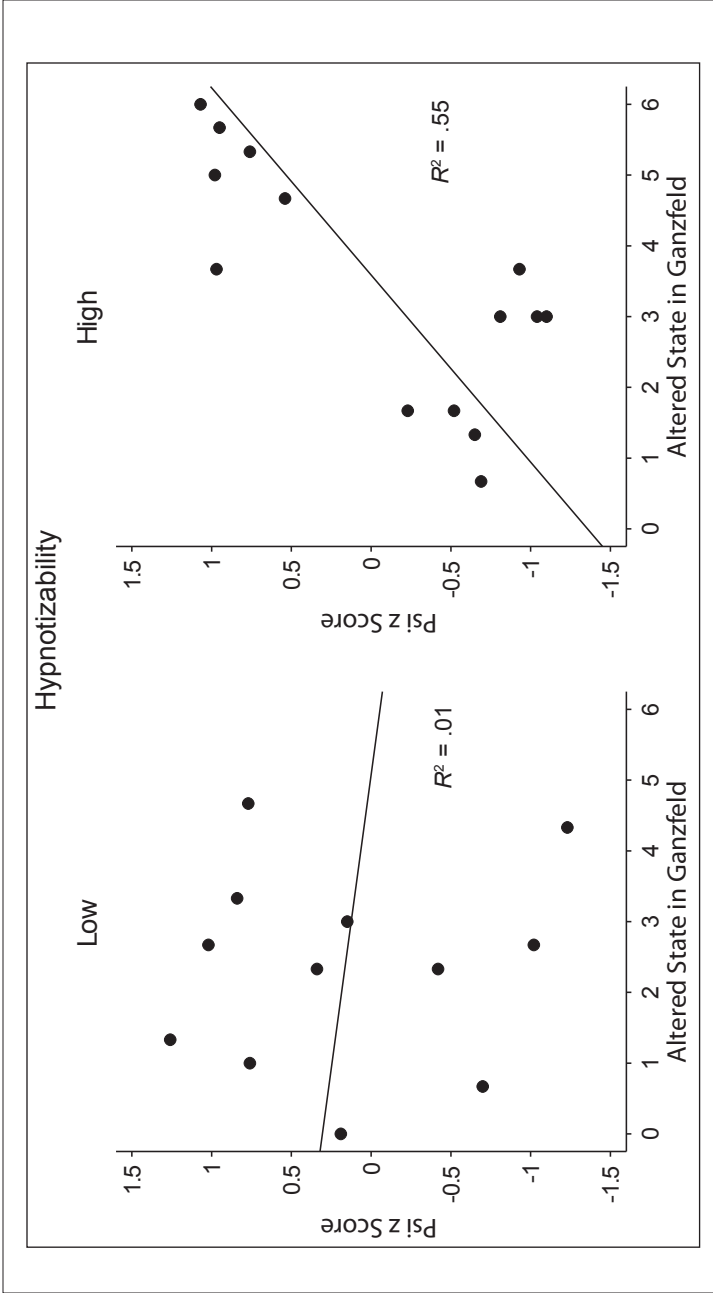


Figure 2. Scatterplots with reported altered state from the first ganzfeld session and psi z scores from the second

Table 3  
*Correlation Coefficients(r) Between Psi z Scores and  
 PCI Major Dimensions for High and Low Hypnotizables*

PCI dimension	Highs (n = 14)	Lows (n = 12)	Total
Altered experience	.65*	-.23	.21
Positive affect	.02	.23	.06
Negative affect	.36	-.17	.13
Attention	.03	-.01	.00
Imagery	-.20	.21	-.08
Self-awareness	-.53	-.50	-.46*
Arousal	.12	.00	.05
Rationality	-.39	-.30	-.32
Volitional control	-.30	-.47	-.33
Memory	-.35	-.05	-.17
Internal dialogue	.04	-.32	-.11

\*  $p < .05$

### Discussion

Our first two hypotheses were supported in that both expectations of success and prior psi experience significantly predicted psi z scores, but only for percipients, not for agents. Contrary to our third hypothesis, however, high hypnotizables did not score significantly higher than low hypnotizables but, after controlling for expectations and prior psi experiences, actually the opposite. There was no interaction between dissociation and hypnotizability in terms of performance on the task. Finally, and of greatest interest, only for high hypnotizables were there strong positive correlations between experiencing an altered state, having specific altered experiences, and psi z scores. Although there was no indication of psi scoring using raw hits, we found moderate to strong correlations with psi z scores, strongly suggesting that for process research z scores are more sensitive.

The positive correlation between percipients' expectations of success in their own trials and their actual performance was similar in strength to that reported by Smith et al. (1997). Smith and Sava (2008) did not find such a correlation in a ganzfeld setting but their questions concerned ESP beliefs and experiments in a more general sense, whereas the question by Smith and collaborators was directly related to the forthcoming task, which has been found to be a better indicator than a general question (Lawrence, 1993). This may explain why the question in this study about individual success was significant whereas the more general one was not.

Percipients who reported having had prior psi experiences performed better than those who did not. This finding replicates the results

summarized by Storm et al. (2010) that ganzfeld is a favorable condition for selected participants, including those who report previous psi experiences. The effect of prior psi experiences in this study was found for high hypnotizables in particular, not for lows. A direction for further research would be to pinpoint whether any particular type of psi experience predicts performance. It might be, for instance, that psi experiences reported to occur during altered states (e.g., dreams, sleep onset) are better predictors of performance in a ganzfeld context than psi experiences that occurred during the ordinary state, at least for high hypnotizables.

The most puzzling finding was the negative correlation of hypnotizability and psi  $z$  scores, after controlling for prior psi experiences and expectations. It makes little sense from the altered-state perspective that low hypnotizables would perform better than highs in a ganzfeld psi task. Other results indicated, however, that experiencing an altered state (and some altered experiences) and reporting prior psi experiences were significant predictors only for high hypnotizables, but not for lows. These results might be explained by a possible interaction between dissociation and hypnotizability (although we did not find a significant interaction in our data). As Figure 2 illustrates, there were two clusters of high hypnotizables that scored in different directions depending on whether they experienced an altered state or not. For the cluster of high hypnotizables with positive psi  $z$  scores, five out of six were high dissociative, suggesting that a subset of high hypnotizable high dissociatives may be positive psi-scorers and another subset psi-missers, whereas low hypnotizables and/or low dissociative may show different patterns. In a previous study, we were surprised that LD highs performed significantly below chance (Cardeña et al., 2009). LD highs scored noticeably, but not significantly, below chance in this study as well, and it is noteworthy that HD, whether high or low hypnotizables, tended to be more successful in the psi task (see Table 2). A very speculative hypothesis is that HDs, regardless of their hypnotizability, are more likely to have had a history of trauma or abuse and thus may have become more likely to develop psi abilities in order to avoid further punishment, as we discussed in a previous paper (Cardeña et al., 2009). It may be that highs who do not experience an altered state, and who may be low dissociative, tend to psi-miss because they feel pressured or start using rational processes in a psi task, whereas lows in general are only slightly affected by, or conscious of, psi information. In any event, it seems worthwhile to continue evaluating the interaction of dissociation and hypnotizability in future research (cf. Cardeña, 2010).

Furthermore, spontaneous comments made during the judging procedure by HD highs who had positive psi  $z$  scores suggest that they based their clip ratings more on hunches than imagery correspondences between the target and their mentation. Louisa Rhine (1953) found that most psi experiences could be categorized, in order of occurrence, as intuitions (hunches), hallucinations (imagery correspondences), or realistic and



unrealistic dreams, and it may be that individuals with different traits use hunches and imagery correspondences differentially in psi tasks. Given that anecdotal psi was a predictor of psi performance for high hypnotizables, grouping these experiences according to Rhine's categories may help predict the strategies used during a psi task. It may be inhibitory to ask participants that have mostly had only psi hunches to base their rating decisions on imagery correspondences, and vice versa. More specifically, it seems that LD high hypnotizables may be more likely to use imagery than their HD counterparts (cf. Terhune & Cardeña, 2010), and it was noticeable that imagery did not relate to psi  $z$  scores in our study. This is an area worth pursuing in the future.

We found moderate to strong correlations between psi performance and the PCI dimensions of experiencing an altered state, decreased self-awareness, and two altered experiences subdimensions (time and perceptual alterations), with other altered experiences having nonsignificant small to moderate correlations. Although not significant, there seemed to be a pattern for ordinary thinking to be negatively related to psi-hitting. Generally, our results may be the clearest evidence until now of a relationship between experiencing an altered state of consciousness and psi-hitting, but only for the select group of high hypnotizables, who are the people more likely to experience such alterations. Our study is also consistent with earlier findings showing a relationship between changes in time perception, perceptual changes, and decreased self-awareness, and performance in psi tasks (reviewed in Alvarado, 1998). There was also a hint that not being in an ordinary rational state may be more conducive to psi hitting, similarly to what Brugman and others (1924, in Alvarado, 1998) conceptualized as being in a "passive state." We should remind the reader that the PCI was administered in a previous ganzfeld session, rather than in the telepathy one, so our results do not refer directly to the specific alterations of consciousness during the telepathy session, but to the participants' previously reported state of consciousness in the ganzfeld setting. We will conduct a content analysis of the telepathy session to evaluate more directly the alterations during the telepathy session itself.

The results have implications for the three hypotheses discussed earlier, namely the altered state, expectancy, and noise-reduction hypotheses. In favor of the altered-state hypothesis, there was a strong correlation between reporting an altered state overall, altered experiences, and performance, even after controlling for expectations. However, this was only evident for high hypnotizables, not for lows. The benefit of ganzfeld as an ASC-inducing procedure might therefore be restricted to only a subgroup of the general population. A study that includes medium hypnotizables would be a welcomed contribution to this research. The results also provided support for the specific expectancy effect of believing that the percipient will be successful in the experiment. The expectancy-performance correlation was independently significant for both high and

low hypnotizables. The correlation was also significant even after controlling for reporting an altered state. The data suggest that expectancy and altered states contribute unique variance to performance. As for the noise reduction model, the present study was admittedly limited in addressing it, but it is worth pointing out that the PCI dimension that probably most closely addresses noise-reduction, attention, did not correlate with psi.

Our study had a number of limitations, foremost the small  $n$ , necessitated by the considerable time demands of our procedure. The fact that, despite the consequent small statistical power, we had a number of our hypotheses confirmed and with a sizeable amount of variance explained suggests that the variables we used are definitely worth investigating further in studies with a larger sample, as we are currently in the process of doing. Another limitation when evaluating the effects of hypnotizability is that we did not measure the whole range of hypnotizability. This restricted variability prevents the detection of possible nonlinear relationships and may inflate effect sizes (cf. Lynn, Kirsch, Knox, Fassler, & Lilienfeld, 2007). Nonetheless, the importance of greater alterations in consciousness among highs is consistent with research using the whole gamut of hypnotizability (Cardeña et al., 2007). It will also be worthwhile to compare the effect of specific hypnotic suggestions on psi z scores in the future. It may be criticized that we dichotomized dissociation scores instead of using actual scores, but this strategy is defensible considering the non-normal distribution of the measure we used (see Cardeña, 2008). A third limitation is that we used the results of a previous session in ganzfeld and related it to the psi score in the telepathy section because this study was part of a larger project. Naturally it would be better to measure any alterations of consciousness in the actual psi-task session. Having said that, the fact that experiencing an altered state in the control condition did not relate to psi z scores substantiates the claim that the measure of altered state during the first ganzfeld session was a valid measure of such alterations in the second session. Another limitation is that we mostly measured variables rather than manipulating them, thus making any causal statement questionable, and our measure of psi was indirect, based on the individuals' judgment of the target and decoys. Finally, we did not have different sets of experimenters, so we cannot disentangle to what extent the possible psi effects can be attributed to the participants, the experimenters, or an interaction of both.

This study yielded several moderate to strong predictors of psi z scores. First, percipients' expectations of success in their own trials correlated positively with performance. Second, percipients who reported previous psi experiences performed significantly better than those who did not report them. These two effects were not evident for agents. Third, the general sense of being in an altered state, and of having particular alterations in experience, correlated moderately to strongly with psi z scores, but only for high hypnotizables. Although opaque, it also seems that dissociation plays a role in psi performance. Overall, a positive relationship between psi z scores

and belief that one will succeed in the study, previous psi experiences, and experiencing alterations of consciousness in a ganzfeld setting by a select group were clearly supported by our study.

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### **Abstracts in Other Languages**

#### *French*

#### **HYPNOTISABILITE, MODIFICATIONS DE LA CONSCIENCE ET AUTRES VARIABLES PREDISANT LES PERFORMANCES A UNE TACHE PSI UTILISANT LE GANZFELD**

**RESUME:** Nous avons examiné comment l'hypnotisabilité, la dissociation, les modifications de la conscience, la croyance au succès, et les expériences psi antérieures sont reliées à la performance à une tâche psi utilisant le ganzfeld. Des participants fortement ( $n = 14$ ) et faiblement ( $n = 12$ ) participèrent à deux sessions. La première incluait des mesures de la dissociation et des modifications de la conscience durant le ganzfeld, tandis que la seconde consistait en une tâche de télépathie avec le percipient de nouveau dans un dispositif ganzfeld. Nous avons fait l'hypothèse que l'hypnotisabilité forte (peut-être en interaction avec la dissociation), les modifications de la conscience, l'attente d'une performance psi réussie, et des expériences psi antérieures permettraient de prédire des performances psi réussies. La croyance des percipients dans leurs succès durant l'expérimentation et leurs témoignages d'expériences psi antérieures se corrélait significativement avec les scores psi z, mais contrairement à notre hypothèse, l'hypnotisabilité en général s'est corrélée négativement avec la performance à une tâche psi. Cependant, les scores psi z se corrélaient fortement à modérément avec l'expérience d'un état modifié et d'autres modifications dans la conscience, mais seulement pour les participants fortement hypnotisables. Bien

que nous n'ayons pas trouvé une interaction générale entre hypnotisabilité et dissociation, nous avons observé qu'au moins un sous-groupe de sujets fortement dissociatifs et fortement hypnotisables semblait être précis lorsqu'ils suivaient leurs "intuitions" plutôt que leur imagerie.

### *Spanish*

#### HIPNOTIZABILIDAD, ALTERACIONES DE CONSCIENCIA, Y OTRAS VARIABLES COMO PREDICTORES DE ACIERTO EN UNA TAREA PSI EN GANZFELD

RESUMEN: Analizamos el efecto de la hipnotizabilidad, la disociación, las alteraciones de la consciencia, la confianza de tener éxito, y experiencias psi previas en una tarea psi en ganzfeld. Personas con hipnotizabilidad alta ( $n = 14$ ) y baja ( $n = 12$ ) participaron en dos sesiones; la primera incluyó medidas de disociación y alteración de la consciencia durante ganzfeld, mientras que la segunda consistió en un experimento de telepatía con el perceptor de nuevo en un entorno ganzfeld. Hipotetizamos que hipnotizabilidad alta (tal vez en interacción con la disociación), alteraciones de la consciencia, confianza en un rendimiento psi exitoso, y experiencias psi previas predecirían un rendimiento psi exitoso. La confianza de los perceptores en su propio éxito en el experimento y sus informes de experiencias psi anteriores correlacionaron significativamente con las puntuaciones z psi, pero contrariamente a nuestra hipótesis, la hipnotizabilidad en general tuvo una correlación negativa con el rendimiento en la tarea psi. Sin embargo, las puntuaciones z psi correlacionaron fuerte a moderadamente con experimentar un estado alterado de consciencia y otros cambios en la consciencia, pero sólo para los altamente hipnotizables. Aunque no encontramos una interacción global entre hipnotizabilidad y disociación, observamos que al menos un subgrupo de personas con alta hipnotizabilidad y disociación parecieron acertar cuando siguieron sus "corazonadas" en lugar de sus imágenes.

### *German*

#### HYPNOTISIERBARKEIT, VERÄNDERUNGEN IM BEWUSSTSEIN UND ANDERE VARIABLEN ALS PRÄDIKTOREN DER ERGEBNISSE IN EINER GANZFELD-PSI-AUFGABE

ZUSAMMENFASSUNG: Wir untersuchten, wie Hypnotisierbarkeit, Dissoziation, Veränderungen im Bewusstsein, Glaube an Erfolg und frühere Psi-Erfahrungen mit dem Treffererfolg in einer Ganzfeld-Psi-Aufgabe zusammenhängen. Versuchspersonen, die leicht zu hypnotisieren waren ( $n = 14$ ) bzw. schlecht ( $n = 12$ ), nahmen an 2 Sitzungen teil. In der ersten wurden Dissoziation und Änderungen im Bewusstsein während des Ganzfeldzustandes gemessen, die zweite bestand aus einer Telepathieaufgabe mit dem Perzipienten in einem Ganzfeldsetting. Wir nahmen an, dass hohe Hypnotisierbarkeit, vielleicht in



Verbindung mit Dissoziation, Veränderungen im Bewusstsein, die Erwartung einer erfolgreichen Psi-Leistung und frühere Psi-Erfahrungen eine erfolgreiche Psi-Leistung vorhersagen würden. Der Glaube der Perzipienten an ihren eigenen experimentellen Erfolg und ihre Berichte über frühere Psi-Erfahrungen korrelierten signifikant mit den Psi-z-Scores, aber – im Gegensatz zu unserer Hypothese – Hypnotisierbarkeit zusammengekommen korrelierte negativ mit dem Abschneiden in der Psi-Aufgabe. Psi-z-Scores korrelierten jedoch hoch bis mäßig mit der Erfahrung eines veränderten Zustandes und anderen Bewusstseinsänderungen, jedoch nur für die leicht Hypnotisierbaren. Obwohl sich kein Gesamtzusammenhang zwischen Hypnotisierbarkeit und Dissoziation zeigte, konnten wir zumindest bei einer Untergruppe leicht dissoziierbarer und leicht hypnotisierbarer Versuchspersonen beobachten, dass diese richtig lagen, wenn sie eher ihren „Eingebungen“ als ihren Bildern folgten.