



Changes in State of Consciousness and Psi in Ganzfeld and Hypnosis Conditions¹

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Abstract. In a previous experiment with participants high (Highs) and low (Lows) in hypnotizability, psi z scores had moderate to strong correlations with percipients' belief of their success and their previous ostensible psi experiences, experiencing an Altered State of Consciousness and other alterations of consciousness during a non-psi ganzfeld session, but only among the Highs. The current pre-registered study had a larger N of only Highs, evaluated in hypnosis and hypnosis + ganzfeld procedures. Participants (N = 35) served as "receivers" in two 20 min sessions of ganzfeld or hypnosis in counterbalanced order. Both sessions used hypnosis verbalizations, but only one of them had sensory homogenization. The authors served as "sender" and "experimenter" in different buildings. As an index of experienced alterations of consciousness, participants filled out the Phenomenology of Consciousness Inventory (PCI) at the beginning and end of the sessions, and gave a rating of 0-100 to 4 film clips (one of them the target), from which psi z scores were derived. Overall, participants did not score better than chance and there was no difference between the conditions. However, for the ganzfeld sessions psi scores correlated moderately ($r = .40$, $p = .02$) with the PCI Altered State shift scores (ganzfeld - baseline scores). Although the overall psi rate was not significant, we found a relation between psi scoring and experiencing an Altered State in ganzfeld psi sessions.

There is converging but not unequivocal evidence that changes in alterations of consciousness can facilitate performance in psi tasks with designs using participants or groups deemed likely to perform well in a psi experiment, although the actual measures for such alterations have been at times non-validated instruments. We start by summarizing research on altered consciousness and psi, including shifts in consciousness.

Studies of Alterations of Consciousness and Psi with Individuals

Some of the most accurate mediums in the early psychical research were impervious to painful stimuli (Gauld, 1982) and their different "trance states" were described by researchers (Hodgson, 1898; Troubridge, 1922; see also Cardeña & Alvarado, 2011). For more recent examples, the gifted participant Van Dam performed best during a "passive state," as determined by physiological observations (Schouten & Kelly, 1978, p. 278), probably indicating low arousal. Similarly, the widely tested psychic

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Lalsingh Harribance's performance correlated with greater density of alpha brainwaves and a presumed relaxed state (Morris et al., 1972). In a summarizing paper, Morris (1977) concluded that an abundance of alpha activity (and presumed relaxation) related to psi success, but in a later review Broughton (2015) found the relation to be inconsistent across studies.

In a comprehensive review of the evidence to that time, Palmer (1978) concluded that for the few studies that had collected phenomenological reports with gifted participants, there was consistent evidence of significantly higher or lower psi scoring related to "the most pronounced" alterations of consciousness (p. 119), suggesting that alterations of consciousness may affect the deviation from chance rather than the direction of scoring. Unfortunately, systematic case research with gifted individuals has almost disappeared from the field in the last few years.

Studies of Alterations of Consciousness and Psi with Groups

A meta-analysis indicated that techniques that may induce alterations of consciousness produced larger psi effects than the ordinary state, particularly with selected samples (Storm et al., 2010). More specific alterations of consciousness related to psi include:

- a. Loss of body awareness, changes in body image, and other somatic alterations, with a sample of meditators (Palmer et al., 1979);, and with high hypnotizables (Marcusson-Clavertz & Cardeña, 2011). In unselected samples the correlations between alterations of consciousness and psi were negative though (Palmer et al., 1977; Stanford & Neylon, 1975); Palmer et al. had predicted that the correlations would be negative with psi scores below chance.
- b. Increased imagery and changes in perception/hallucinations (Honorton et al., 1971; Marcusson-Clavertz & Cardeña, 2011; Palmer et al., 1977, 1979; Rock et al., 2013; Sargent, 1980, 1982, Sargent et al., 1982),
- c. Experiential and EMG indexes of relaxation (Braud & Braud, 1974; *contra* Palmer et al., 1977),
- d. A sense of self-transcendence (Carpenter, 2004).

With respect to time alterations, Bierman (1988) reported a strong 77% psi hitting (MCE = 25%) in the 10 volunteers who experienced greater time contraction (i. e., an event experienced as lasting less than it chronologically does) in a ganzfeld protocol. Other studies have also reported a relation between time contractions or other alterations and psi scoring (Marcusson-Clavertz & Cardeña, 2011; Palmer et al., 1977; Rock et al., 2013; Sargent, 1980; Schmeidler, 1982; Stanford & Neylon, 1975). Nonetheless, some studies have not replicated this relation (Palmer et al., 1979; Watt et al., 2020). One study reported that psi scoring during ganzfeld was higher than in a non-ganzfeld condition (33% vs. 18%), but it did not find a relation between general alterations of consciousness and psi scores, although using an instrument to assess changes in consciousness (GEEF), whose specific items and psychometric properties were not described (da Silva et al., 2003). A study reported a significant relation between a factor involving alterations of consciousness (including imagery and relaxation) and *psi missing* (Palmer et al., 1977; see also Pérez-Navarro & Cox, 2012, who used questionable items to assess changes of consciousness). It is also important to mention that Blackmore (1987) visited Sargent's lab and criticized some procedures and "urged caution" (p. 186) in interpreting their results, to which members of the lab responded (Harley & Matthews, 1987; Sargent, 1987). In any event, other laboratories whose procedures have not been questioned have also reported all of the findings by Sargent and collaborators mentioned in this paper.

Shifts in States of Consciousness and Psi Scores

A related but different issue is whether psi scoring relates to measured changes from the baseline state of consciousness. Some decades ago, following an idea from Gardner Murphy (1966), Honorton and colleagues evaluated the relation between shifts of consciousness and psi in a series of studies. Honorton, Davidson, and Bindler (1971) reported that greater shifts of consciousness during a biofeedback generation/suppression protocol related to higher card-guessing scores. In this as in the following two papers, Honorton et al. used a state report scale ranging from 0 (normally alert) to 4 (more or less oblivious to your surroundings). In a study using hypnotic or waking imagination conditions with groups of varying suggestibility, Honorton (1972) found that in the hypnosis conditions those with higher than average mean state reports had significantly higher psi scores than those below average, and those with higher than average shifts in state in hypnosis had significantly more psi hits than the others. In another study in the series, Honorton, Drucker, and Hermon (1973) used a partial sensory deprivation technique contraption called the “witches’ cradle.” Although there was no overall psi effect for the 30 participants, there were significantly more psi hits from those reporting above average state shifts than from those below average, and hits were significantly associated with larger state shifts as compared with misses. One study concluded that there was no relation between hypnotic depth reports and psi, but did not provide descriptive or inferential statistics for their conclusion (Parker & Beloff, 1970). Finally, Sargent (1980, p. 111), found in his Study V with ganzfeld that psi scores correlated strongly with experiencing a change in state of consciousness, $r(28) = .51, p = .004$. abundant visual imagery, $r(28) = .48, p < .01$, and low estimates of time elapsed $r(28) = .38, p < .05$.

Ganzfeld Studies of Alterations of Consciousness and Psi

Different procedures that seek to affect the state of consciousness offer indirect support for a relation between altering consciousness and psi scores. For instance, meta-analyses for the use of hypnosis found it to be a facilitatory condition (Honorton, 1977), although the results might have been mediated by order effects (Stanford & Stein, 1994). In the last few decades, the most often used technique to induce alterations of consciousness has been the sensory homogenization setup known as ganzfeld, which has provided meta-analytic support for the evidence of psi (Storm et al., 2010), even after taking into consideration potential artifacts (Baptista, Derakhshani, & Tressoldi; Cardeña, 2018). Furthermore, studies directly comparing ganzfeld versus no-ganzfeld stimulation have shown an advantage of the former (e.g., da Silva et al., 2003; Roe et al., 2020). In this section, we emphasize research on specific alterations of consciousness and psi scoring in ganzfeld, beside the Sargent (1980) study on shifts in consciousness mentioned above.

Research with transcendental meditators derived two experiential factors through exploratory factor analysis, one of which measured loss of body awareness and regressive imagery and correlated significantly with the psi ratings of independent judges but not the meditators (Palmer et al., 1979). A previous study by the authors (Marcusson-Clavertz & Cardeña, 2011) with individuals high and low in hypnotizability, employed a telepathy ganzfeld setup with acquaintances of the percipients as “telepathic agents.” Alterations of consciousness were measured with the Phenomenology of Consciousness Inventory (PCI; Pekala, 1991) on a first ganzfeld session evaluating psychological variables, and were then correlated with performance on the second ganzfeld session, which included the telepathy trial.

The psi z-scores had moderate to high correlations with: belief in individual success ($r = .50, p < .01$), and prior psi experiences ($r = .41, p < .05$). The *Altered State* (of consciousness) scale of the PCI had a strong correlation with psi-scores among Highs ($r = .74, p = .002$), but not among Lows ($r = -.10, p = .75$). At the exploratory level, the following scales had small to large correlations among the Highs: *Altered Experience* ($r = .65, p = .01$) and its subscales evaluating alterations in *perception* ($r = .65, p = .01$), *time sense* ($r = .60, p = .02$), *meaning* ($r = .50, p = .07$), and *body image* ($r = .33, p = .25$). For the full sample, there was a moderate negative correlation with psi scores for *Self-awareness* ($r = -.46, p < .05$). In sum, the results suggested that among the Highs having the sense of being in an altered state of consciousness and specific alterations of consciousness related to giving higher ratings of the target. There are, however, some caveats to that study. First, the N was small, particularly when dividing the group in two, which may produce overestimation of size effects and less reliable replications (Button et al., 2013), particularly considering the large number of dimensions of the PCI. Second, the PCI was evaluated after a ganzfeld session other than the one in which the psi task occurred, so it should be considered an indirect measure of how participants might have felt in the psi session.

Other ganzfeld (precognitive) studies have also used the PCI, conducted after this one and with unselected samples. In three different studies with unselected participants evaluating remote viewing with and without ganzfeld stimulation, all ganzfeld procedures produced sizeable and significant results above chance (Roe et al., 2020). In one of the studies the authors found moderate correlations between psi outcomes and three PCI dimensions: *absorption*, $r = .34, p = .04$, *arousal*, $r = -.34, p = .04$, and *internal dialogue*, $r = -.42, p = .01$. In the second study, the only moderate correlation was between *alterations in time sense* and psi outcomes, $r = .32, p = .05$, and in the third study none of the PCI scales correlated with psi scores. Watt, Dawson, Tullo, Pooley, and Rice et al. (2020), with a selected sample (practitioners of the arts or other mental discipline and/or with previous psi experience) found an overall significant psi effect, but no correlation reaching .2 for any of the PCI dimensions and psi scores.

In sum, across procedures geared to instigate alterations of consciousness, psi scoring has related, albeit inconsistently, with specific alterations of consciousness (e.g., alterations in time experience and somatic experience), a general sense of being in an altered state, and experiencing larger shifts from baseline in state of consciousness. However, earlier research was largely exploratory, with non-validated instruments (except the studies using the PCI recently), and without pre-registration of the hypotheses.

In addition to potentially inducing alterations of consciousness, ganzfeld reduces perceptual noise due to the homogeneous, unchanging sensory stimuli. According to the noise reduction model this change may increase psi effects in ganzfeld (Honorton & Harper, 1974, see also Storm et al., 2010). However, little attention has been paid to internal distractions in the ganzfeld setting, including thoughts about the purpose of the procedure, the challenges it presents, and evaluations of one's own performance. These task re-appraisal thoughts have been termed task-related interferences (Matthews et al., 1999) and are associated with poor performance in signal detection tasks (Smallwood et al., 2004), and might also impact negatively psi performance.

We also noticed in our earlier study that there seemed to be a decline effect, in which the initial sessions showed considerable higher psi scoring than in the second third. Pratt, Rhine, Smith, Stuart, and

Greenwood (1940, p. 198) estimated that for a collection of many studies there was a rank correlation = .51 between the psi score and number of trials, with smaller trials producing greater effects. Although Baptista, Derakhshani, and Tressoldi (2015) did not find that the effect size of ganzfeld research has declined across time, a different question is whether it declines within a study. We decided to test whether psi scoring would decline during the 2nd third of the sessions, to perhaps recover later.

Objectives

Our objectives in this ganzfeld telepathy study were to:

1. Test whether individuals likely to be successful (i.e., Highs with at least some belief that they could succeed in the experiment and reporting some ostensible psi experience) would perform at a better than chance level. This is a confirmatory hypothesis of ganzfeld meta-analytic studies showing significant psi hitting with special populations (Storm et al., 2010).
2. Evaluate if the ganzfeld setup is superior to a hypnotic condition. This was an exploratory hypothesis as we are not aware that this hypothesis has been tested before, and we did not expect significant differences between the conditions.
3. Investigate the association between experiencing an altered state during the experimental conditions and psi z-scores. This is a confirmatory hypothesis since we previously reported a strong positive correlation between these two variables.
4. Evaluate the exploratory hypothesis of whether the first third of trials would be significantly higher than the second third, as we had observed ostensible in-study decline effects in the previous study.
5. Test the exploratory hypothesis that higher task related re-appraisals/interferences (e.g., “ I thought about the purpose of the experiment,” “ I thought about how much time I had left”) during mentation would be associated with lower psi z scores, in accord with the noise reduction model.
6. Assess whether psi scores of the target would correlate with an independent query about how certain the person was of his/her rating. This was a confirmatory hypothesis since we had observed such a relation in our previous study.

Method

Participants. After careful and lengthy screening, individuals scoring as high hypnotizables (about 5-10% of the population), open to the possibility of psi, and without current distress were selected for the study. Mostly current or recent university students ($N = 35$) participated, of which 25 were women, $M_{age} = 25.06$ ($SD = 8.61$, range 19-61). The first author, a non-Swede professor, served as “sender” whereas the second author, a Swedish doctoral student at the time, carried out the experimental procedures in another building. There was also an RA, a female undergraduate student, who showed participants the target for both sessions at the end of the second session. All three people in the team and the RA are supportive of the psi hypothesis. The study had been approved by the appropriate Swedish official agency and all participants signed consent forms. Participants in the whole procedure got two cinema tickets at the end as compensation.

Procedure. We conducted a repeated measures design with a within-subjects variable (ganzfeld vs. hypnosis) in two stages. The first one involved screening with a group hypnotizability test (Harvard Group Scale of Hypnotic Susceptibility; Shor & Orne, 1962) to identify participants scoring as High hypnotizables (Highs). Because the percentage of those scoring as Highs is around 10% and there were other inclusion criteria, we tested circa 1,650 individuals to identify 190 Highs, whom we tried to contact (some had completed the hypnosis test some time before this experiment and had left the area). Those who were interested in participating, believed that they might in principle succeed in a psi experiment, and reported at least one ostensible previous psi experience underwent individual hypnosis testing to ascertain that they were indeed Highs (using the Stanford Hypnotic Susceptibility Scale: C; Weitzenhoffer & Hilgard, 1962). They also completed a confidential brief questionnaire (the Brief Symptom Inventory or BSI; Derogatis, 1975) to rule out those who were experiencing marked distress in any item of the questionnaire without a temporary reason such as the death of a close one. If participants continued to score as High, they were invited to go onto the second stage and filled out a consent form then. Purposefully, for confidentiality reasons, no data were kept on the handful of people who were not invited to the second stage of the study. Most of them were not invited because they did not continue to perform as Highs, with one or two people expressing some distress during the previous week. The reason why they were not invited to continue was mentioned to them and they were invited to ask any questions about it. None of them seemed to be troubled by not continuing with the project according to the first author's observations.

On the second stage, selected participants underwent two sessions, in counterbalanced order. Before each session there was a short informal meeting with the researchers in the building where the "sender" was located to create a friendly atmosphere. We mentioned that there is experimental evidence for psi and encouraged participants to: 1) aim to obtain the information that would be seen by the "sender," 2) remain open to what they might experience, and 3) notice if something came to their minds that seemed to stand out for any reason (the statements were not written to have a more natural interaction) (see White, 1964). They were encouraged to ask any question and then the second author and the participant went to a lab in a separate building.

Each session began with a 2-min resting baseline with lights turned off and eyes closed. Subsequently the PCI was completed with reference to the 2 min period. Participants were then asked to become cognizant of a film clip being seen by the first author in another building at that moment. The dynamic film clips were randomly chosen by a computer in another building, through an automated protocol. One session was carried out during a ganzfeld protocol including 20 min of exposure to a red, dim light through halved ping pong balls and listening to pink noise through headphones (9 min of a hypnotic induction, then 10 min of thinking out loud reporting, and 1 min deinduction). The other, hypnotic, session differed by having no lights or noise and asking participants to close their eyes for the session (although the induction in ganzfeld had a remark about keeping the eyes open, we have observed in various ganzfeld projects that participants often spontaneously close their eyes while still maintaining the experience of redness). Other than asking participants in ganzfeld to keep their eyes open, the inductions were identical in both conditions, including a suggestion to go into a "deep hypnotic state" and suggestions to focus on the recorded induction's voice and go through a progressive

tensing and relaxation set of instructions, with a background of wavesound. The sender listened to the recorded induction to try to be in a more similar state as the receiver.

Participants were asked if they wanted the experimenter to be seated outside the room during the experiment. Because most did not have a preference, he stayed in the room. At the end of the 20 min stimulation, participants were asked to review their mental activity during the thinking out loud reporting phase before the computer showed them four video clips (one was the target), each about 1 min, arranged randomly by a computer. Participants were asked to give their rating of confidence for each clipping on a 0-100 scale and no clips could be given identical scores. After submitting response to the computer software, but before given feedback, participants were asked to complete the PCI in reference to the hypnosis/ganzfeld condition, as well as a few questions on confidence of success and strategies used. Participants were told by the RA at the end of the second psi session which clips had been the targets, which the RA found out just before telling them.

An automated randomization was applied to this project through a Java program. This program operates a pseudo-RNG called SecureRandom. The percipient/PI's computer randomly selected a target clip from a pool of 116 clips divided in 29 fixed sets of four clips named 1a, 1b, 1c, 1d, 2a, 2b, etc. After the target clip has been shown to the sender 10 times, the information was sent to the receiver's computer, for which SecureRandom had randomized the presentation order of the target and the three decoy clips from the same set. After percipients submitted their ratings, a data file was automatically stored with session ID, ratings, target identity, and presentation order.

We had previously tested a simulation with a large N that showed that target and distractors were equally distributed in the ordering of the film clips, We tested the pseudo-RNG before starting to run the experiment by simulating 1,500,000 trials, and the relative frequency of each of clips a, b, c, and d being selected as targets did not deviate from MCE (1/4) by more than 0.1%. The relative frequency of each of the 29 sets being selected did not deviate from MCE (1/29) by more than 0.1%. The relative frequency of each of the 116 clips being selected as target did not deviate from MCE (1/116) by more than 0.1%.

Measures

The *Brief Symptom Inventory* (BSI; Derogatis, 1975) is a 53-item measure of general distress with a scale from 0 (*not at all*) to 4 (*extremely*) for each item. The scores were purposefully not entered as data but used only to screen out potential participants who reported distress during the week preceding the evaluation.

The *Dundee Stress State Questionnaire* (DSSQ) is a self-report instrument of which we used the scale measuring task-related cognitive interferences (Matthews et al., 1999, 2002). This scale has eight items (e.g., "I thought about my level of ability", "I thought about how much time I had left") answered on a scale from 1 (*never*) to 5 (*very often*). We summed all item scores to measure task-related interferences (TRIs). In this study we adapted it to refer to the 10-min reporting phase. Cronbach's α was .85 for ganzfeld and .80 for hypnosis.

The *Harvard Group Scale of Hypnotic Susceptibility* (Shor & Orne, 1962) is a group measure of hypnotizability. Participants indicate whether they responded to a given suggestion. The scale consists of 12 items and the score is the sum of all responses. Respondents who scored at least 8 on this scale and also had high scores on a related subjective scale were then tested with a more stringent individual scale to ascertain their high hypnotizability (see below).

The *Phenomenology of Consciousness Inventory* (PCI, Pekala, 1991) is a valid and reliable self-report questionnaire completed in reference to a preceding stimulus condition. Each of the 53 items provides two opposite statements in a seven-point scale. The PCI assesses 12 major dimensions of consciousness and 14 sub-dimensions. The dimensions (and sub-dimensions) 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, vividness), attention (direction, absorption), self-awareness, altered state, internal dialogue, rationality, volitional control, memory, and arousal.

The *Stanford Hypnotic Susceptibility Scale, Form C* (Weitzenhoffer & Hilgard, 1962), is considered the “gold standard” of hypnotic susceptibility measurement, and those scoring 9 or higher in a scale of 0-12 are considered to be high hypnotizables.

Analyses. The dependent measure was psi z-scores, calculated by subtracting the mean score of all four ratings from the target score and then dividing that value by the SD for all four ratings (Marcusson-Clavertz & Cardeña, 2011; Stanford & Sargent, 1983). Utts (1988) had previously estimated that for $N = 100$ sessions the power for a ganzfeld study would be 0.54, for unselected samples. We thus estimated that 70 sessions to evaluate the hypothesis of psi (i.e., 35 participants \times 2) would be adequate in this sample as selected groups show in general higher effects than unselected ones (Storm et al., 2010). Derakhshani (2013) estimated that 56 trials with selected participants in ganzfeld should provide 80% power (but see Bierman, Spottiswoode, & Bijl, 2016). We pre-registered the study in the Koestler Parapsychology Unit (http://www.koestlerparapsychology.psy.ed.ac.uk/Documents/KPU_Registry_1006.pdf).

We used repeated measures ANOVAs and t tests to compare group means, and correlations to assess the strength of relation between variables. For effect sizes we report correlations and eta squares. We report here all the preregistered hypotheses, with the exception of the exploratory one on Pragmatic Information, which could not be evaluated precisely. Following the pre-registration we tested the three confirmatory hypotheses with one-tailed parametric tests ($\alpha = .05$). For the exploratory analyses we report two-tailed tests and follow the American Statistical Association (Wasserstein, 2016) recommendation of not basing our conclusions solely on whether a p -value exceeds a threshold, whether .05 or another, but rather report the relevant statistic and probability value. We avoid using “significant” criteria other than in reporting our preregistered confirmatory hypotheses and previous results. Our raw data are stored at <https://open-data.spr.ac.uk/node/48/submission/129>.

Results

Hypothesis 1 was not supported, with the mean of z scores during ganzfeld being slightly below chance, $M = -0.09$ ($SD = 0.91$), $t(34) = -0.60$, $p = .72$, one-tailed, and those for hypnosis being slightly

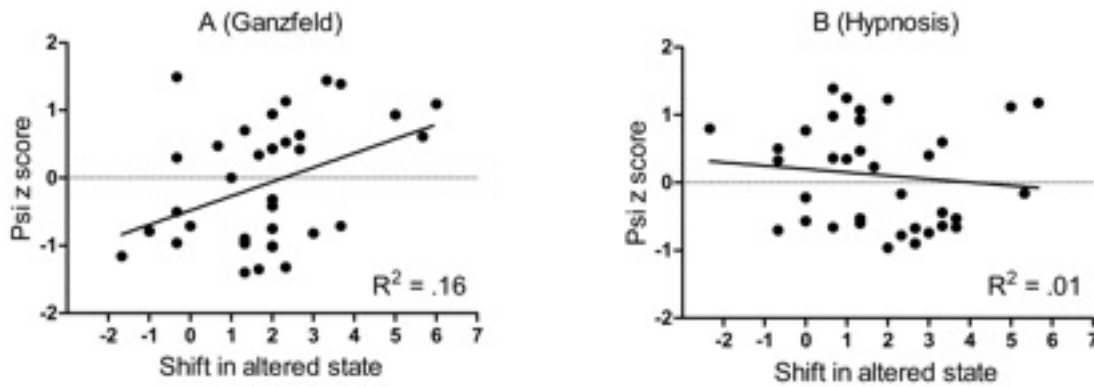
above, $M = 0.11$ ($SD = 0.76$), $t(34) = 0.90$, $p = .19$, one-tailed. Thus, there was no evidence for overall psi scoring. For hypothesis 2 we did not expect a significant difference between ganzfeld and hypnosis, and the difference was trivial, $t(34) = -0.98$, $p = .33$. Psi z-scores in ganzfeld and hypnosis were not correlated with each other, $r(33) = -.11$, $p = .52$. We also evaluated potential condition order effects on psi z scores by performing an ANOVA with one within-subjects factor (Condition: ganzfeld vs. hypnosis) and one between-subjects factor (Order: ganzfeld first vs. hypnosis first). There was no main effect of Order, $F(1,33) = 1.11$, $p = .30$, $\eta_p^2 = .03$, nor an interaction between Condition and Order, $F(1,33) = 0.22$, $p = .64$, $\eta_p^2 = .01$.

The third, confirmatory, hypothesis, proposed that there would be a relation between experiencing an altered state and psi scores. First, a manipulation check showed that in both ganzfeld and hypnosis participants reported expected changes in consciousness in the PCI as compared with the respective baselines. We conducted MANOVA with the 12 PCI dimensions as outcomes and Induction (pre vs. post) and Condition (ganzfeld vs. hypnosis) as within-subjects factors. As expected, there was a main effect of Induction, $F(12, 23) = 8.92$, $p < .001$, $\eta_p^2 = .82$, showing that the PCI pre- and post-measures were different, with the following showing independent significant effects at $p < .01$: increased Altered Experience ($\eta_p^2 = .45$), Altered State ($\eta_p^2 = .62$), Attention ($\eta_p^2 = .27$), and Negative Affect ($\eta_p^2 = .38$), and decreased Self-Awareness ($\eta_p^2 = .58$), Rationality ($\eta_p^2 = .40$), and Voluntary Control ($\eta_p^2 = .60$); increased Imagery ($\eta_p^2 = .12$) and reduced Internal Dialogue ($\eta_p^2 = .13$) differed from baseline at $p < .05$. The interaction between induction and condition on the PCI dimensions did not differ significantly, $F(12, 23) = 1.26$, $p = .30$, $\eta_p^2 = .40$.

The results supported hypothesis three about a relation between experiencing an altered state and psi scoring, but only in the ganzfeld condition. The Pearson correlation between PCI ganzfeld altered state shift and ganzfeld psi z score was $r(33) = .40$, $p = .009$ (one-tailed, see Figure 1; Spearman's, $r(33) = .42$, $p = .006$, one-tailed.) whereas the correlation between hypnosis altered state shift and hypnosis psi z score was negative and non-significant, $r(33) = -.12$, $p = .75$ (one-tailed).

Figure 1. Scatterplot of psi z-scores and shift in altered state scores in (A) ganzfeld, and (B) hypnosis. Mean chance expectation for psi z scores is indicated by the horizontal line at zero.

Exploratory correlations with the other PCI scales (and subscales of interest) are shown in Table 1. Using Cohen's convention (1988) for interpreting correlations, for ganzfeld there were medium correlations between psi and experiencing an altered state, being in an absorbed state, amount of imagery, and being less aroused, with small to medium correlations for attention and its subscales. For hypnosis



there was only a small correlation between psi scores and less arousal. We also examined whether ganzfeld and hypnosis induced different shifts in altered state, altered experience, imagery, arousal, and attention, but there were no significant differences between the conditions, $t_s < 1.5, p_s > .10$.

Table 1.
Correlations (two-tailed p values) between psi scores and PCI scales and subscales by Condition

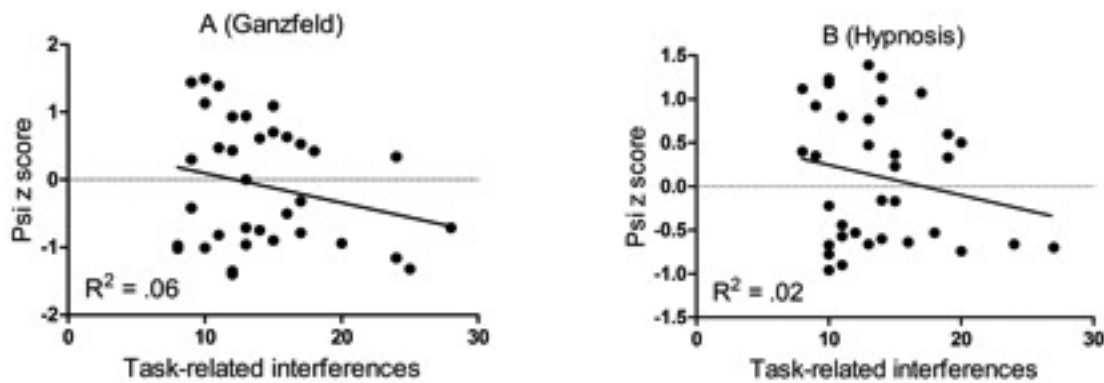
	AE	PA	NA	ATT	Da	Ab	IM	Am	Viv	SA	AS	AR	RA	VC	ME	ID
Gan	.08 (.65)	-.01 (.95)	.07 (.70)	.29 (.09)	.23 (.18)	.30 (.09)	.21 (.23)	.31 (.07)	.08 (.65)	.12 (.48)	.40 (.02)	-.32 (.06)	.05 (.76)	-.09 (.60)	.004 (.98)	-.004 (.98)
Hyp	.07 (.67)	-.20 (.25)	.13 (.44)	-.16 (.36)	-.15 (.39)	-.10 (.57)	-.03 (.84)	-.15 (.40)	.12 (.51)	.13 (.46)	-.12 (.51)	.27 (.11)	.06 (.74)	.07 (.70)	.20 (.25)	-.19 (.27)

The fourth, exploratory, hypothesis was not supported since the first third of the sessions ($n = 12$) did not differ noticeably from the next third ($n = 12$) in ganzfeld, $t(22) = 0.28, p = .78$, or hypnosis conditions, $t(22) = 1.16, p = .26$.

The next exploratory hypothesis, that higher task related re-appraisals or interferences (TRI) would interfere with psi performance had small correlations in the direction expected for ganzfeld, $r = -.24, p = .17$ and hypnosis, $r = -.21, p = .23$. As can be seen in Figure 2, there were quite a few participants who reported high TRI in ganzfeld ($M = 14.3, SD = 5.0$) and hypnosis ($M = 13.8, SD = 4.5$). TRI during ganzfeld and hypnosis had a large correlation, $r = .50, p < .01$, showing that those individuals who reported greater amount of TRI in one condition were also likely to report greater amount in the other.

Figure 2. Scatterplots of psi z scores and task-related interferences in (A) ganzfeld and (B) hypnosis.

The last exploratory hypothesis, that individuals' subjective ratings of their success in the session would correlate with the psi z-scores was not supported either for ganzfeld, $r = -.05, p = .76$, or hypnosis, $r = -.13, p = .46$, indicating that their self-evaluation of success was not accurate.



Discussion

To summarize the results, two confirmatory hypotheses were not supported (no overall psi effect, no correlation between self-confidence and actual success), whereas one confirmatory hypothesis was (a correlation with experiencing being in an altered state, but only in ganzfeld, not hypnosis). Ganzfeld and hypnosis conditions did not show any significant difference in PCI or psi scoring.

First, we should discuss possible explanations for the lack of an overall psi effect. We thought that by using a select group of high hypnotizables without a negative expectation for the psi experiment, we would obtain sizeable psi effects such as those found in research with other select samples (e.g., Schlitz & Honorton, 1992). Our lack of a supportive result can be explained in a number of ways. First, it could be that there was no evidence of psi to begin with (Alcock, 2003). However, this does not fit with the non-trivial correlation between psi scoring and shifts in altered state, consistent with some previous research (e.g., Sargent, 1980).

Another possibility is that our procedure discouraged the emergence of an overall psi effect, and, in retrospect, it had some limitations. First, we chose a ganzfeld exposure of 20 min because high hypnotizables get into a deeper altered state more quickly than those less hypnotizable (e.g., Cardeña et al., 2013), but this may not have been enough to fully exploit some of the other presumed effects of ganzfeld stimulation (e.g., greater alteration of consciousness with time, greater stimulus hunger), thus failing to attain an overall psi effect. We discovered after we started our study that when Honorton (1977, p. 465) dichotomized successful vs. non-successful ganzfeld studies to that date, he found that the mean duration of *successful* ganzfeld exposure was 37 minutes, compared with a mean of 22 minutes for the unsuccessful ones, although only a few studies had been conducted by that time. An updated meta-analytic study on ganzfeld duration and psi outcomes could shed light on this issue. Our 20 min might have been insufficient to obtain an overall noticeable psi effect. On the other hand, analyses showed that both conditions produced expected changes in reports of alterations of consciousness, with the only surprise being increased negative affect. A plausible explanation is that participants during the conditions experienced negative effect due to the pressure to perform well in the psi task.

We also conducted an ANOVA to compare the scores of the AS scale at the end of the session

between our study and the studies by Roe et al. (2020) and the one by Watt et al. (2020) for which data were provided to us by the authors, Mean scores for our sample, $M = 4.26$, $SD = 1.31$, were higher ($p < .001$, unadjusted for multiple comparisons, $p < .05$ after Bonferroni adjustments) than those for Watt et al.'s, $M = 3.18$, $SD = 1.41$, and Roe et al.'s study 1, $M = 2.32$, $SD = 1.00$, and Roe et al.'s study 2, $M = 2.69$, $SD = 1.00$. These results are consistent with the general finding that hypnosis and ganzfeld elicit reports of greater alterations of experience among high than among medium or low hypnotizables (e.g., Cardeña & Terhune, 2018; Marcusson-Clavertz et al., 2012; Pekala & Kumar, 2007).

However, even for Highs some alterations of consciousness related to psi scoring, such as changes in imagery, may require a certain amount of time after an induction (see Cardeña, 2005; Cardeña et al., 2013). In an ongoing data collection using ganzfeld for a non-psi project, the first author has observed that the experience of complete darkness that Honorton (1977) had also described tends to require more than 10 min post-induction, even for Highs.

The relation between experiencing a shift in altered state and psi scores only occurred for ganzfeld, which is consistent with previous research comparing ganzfeld with a silent condition (cf. Stanford, 1987, p. 52). It should be mentioned, though, that the hypnosis condition did not include specific suggestions that might have increased psi scoring, such as experiencing an expansion of consciousness, something that will be worth exploring in the future.

A potential explanation for some studies finding a relation between altered consciousness and psi and others not is that the relation may occur only for high hypnotizables, who are more likely to experience alterations of consciousness (Cardeña & Terhune, 2014). For a subgroup of them this alteration may mediate successful scoring through a greater sense of interconnectedness and a lowering of critical thinking (Cardeña, 2005, 2010). The discrepant findings for the recent studies using the PCI in ganzfeld suggest that there may be different paths to achieve psi effects, along the lines of T. X. Barber's theory (1999) to explain high hypnotizability. He proposed that there are three groups who can achieve high suggestibility: fantasy-prone, dissociative-prone, and those who are very motivated but do not readily experience alterations of consciousness. It may be that high scoring in psi tasks may also be accomplished through different processes: experienced alterations of consciousness, including dissociative processes for some, and high motivation and attentional focus for others. This multiple path approach would bring greater harmony to studies that include procedures to alter consciousness such as ganzfeld with those that do not and may only require some attention and focus (e.g., remote viewing). (Cardeña, 2006). Already in 1896 William James had mentioned that a hypnotic state was not in itself psychic but might facilitate psi phenomena, as might dissociative processes ("alternate personality," 1896, in Taylor, 1983, pp. 92-93). The exploratory correlations between psi scores and imagery, absorption, and reduced arousal in this study match previous individual and group studies of relaxation and psi, and partly some of the results of Roe et al (2010), and may signal processes other than being in an altered state that facilitate psi scoring.

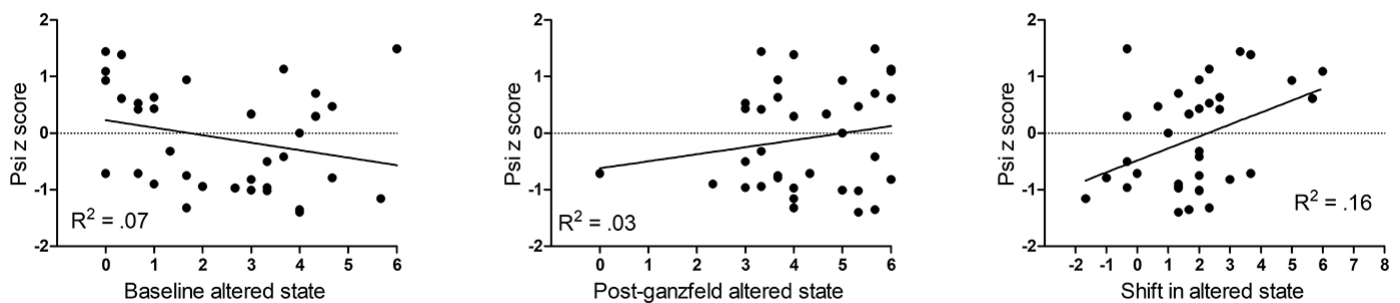
Another plausible explanation for the lack of an overall effect is that the "sender," was a stranger to the participants. Two ganzfeld studies that systematically compared dyads of people close with each other reported non-significant effects for stranger dyads and significant ones for dyads formed by peo-

ple close to each other (Broughton & Alexander, 1997; Sargent, 1980, experiment V, page 76). A way to solve this issue would be to favor precognition experiments, in which the person only needs to think about “communicating” with him/herself in the future, greatly simplifying logistics, and with a very good track record, as Watt et al. (2020) propose. Another potential explanation is that our two studies may just show a psychological or parapsychological experimenter effect (Palmer & Millar, 2015) in which only the preferred hypothesis of the researchers gets support. Finally, showing participants only the clip of the target (to avoid possible contamination of other clips) and using independent judges to evaluate potential hits is worth considering in future research (cf. Palmer et al., 1979).

The discrepant findings of this study and those of Roe et al.’s and Watt et al.’s may also be due to our using shift scores. Using shifts in consciousness rather than a measure at the end of the session may be a more sensitive indicator (cf. Stanford, 1987). To reinforce this point, here is a graph showing the correlations between PCI ganzfeld baseline, end of session, and shift scores. The relation with psi scores only attains for the last one. A possible explanation for our results is that baseline scores may show inflated ratings of being in an altered state, given the demand characteristics of ganzfeld studies, and using shift scores may help correct this bias. Furthermore, using only post-ganzfeld scores greatly reduces the variability of scores. In our data almost everyone reported a score of 3 or higher in a scale of 0-6 (see Fig. 3).

Figure 3. Scatterplots with psi z scores and PCI scores at baseline, at the end of the ganzfeld session, and shift scores (i.e., differences scores; ganzfeld - baseline).

As for higher task related re-appraisals interfering with psi performance, the correlations were small and difficult to evaluate properly as there was a floor effect (i.e., many participants reporting none or extremely few task-related reappraisals), but it is consistent with the unreliable relations between absorption (i. e., less mental interference) and psi scoring. The construct might be worth pursu-



ing further in a more detailed design with greater time-on-task and more opportunity for task-related interferences, greater statistical power, and a more heterogeneous population. Using experience sampling methods to evaluate interferences would be a way to test this idea without relying on long term memory.

Some paths for future research are worth considering. First, it is important to specify which alterations of consciousness are relevant to increased psi scoring and why. Second, it is important to evalu-

ate shifts of consciousness as an independent variable of psi performance, and not just end-of-session measures. To make this idea more feasible, it would be a good idea to choose only those scales or items of the PCI that have been related to psi, to make testing less onerous, and/or to develop a shorter questionnaire with the most promising items. There is some consistency in various research findings, so more precise evaluations of such dimensions as time estimation, body image, and imagery that are not exclusively self-reports ought to be developed. And, although we used a counterbalanced presentation and found no order effect, it cannot be assumed that results with a within-subject design will generalize to a between-subjects one.

Another option is to return to more intensive repeated investigation of promising individuals (e.g., individuals who experience large shifts in altered states and perform well on a preliminary ganzfeld test) to evaluate conditions that may increase effect sizes. It may also be fruitful to employ mixed-methods designs with these individuals to evaluate how their alterations of consciousness and potentially related neurodynamics relate to scoring in a psi task. For instance, Honorton (1972) proposed that content analysis of participants' mentations could be a more sensitive way to detect potential psi information than merely taking an overall judgment, but his call has gone largely unheeded. Intensive, theoretically-driven small N studies might advance the field (cf. Smith & Little, 2018).

At the other end, large N, multi-laboratory ganzfeld studies with selected populations (e.g., highs) can test the reliability and generalizability of specific association between altered state and psi performance and evaluate additional variables, such as time contraction or imagery, which may mediate/moderate the relation between alterations of consciousness and psi. Multisite efforts could clarify two very important questions that merit revisiting: 1) Which variables consistently predict success in ganzfeld across laboratories? Earlier proposals (e.g., Dalton, 1997; see also Cardeña & Marcusson-Clavertz, 2015, for a more recent review) such as the advantage of using select groups continue to receive support (e.g., Baptista et al, 2015), although selecting them based on the Myers-Briggs FP (Feeling Perception) preference clashes with the questionable psychometrics of that measure (e.g., Pittenger, 1993). 2) It behooves us to test different, but not necessarily incompatible, processes predicting success in ganzfeld. Proposed mediators of psi success in ganzfeld include: "noise reduction" (Honorton, 1977), changes in expectancy (Braud, 1978), reduction of encoding constraints/lability (Stanford, 1987), and experiences of transcendence (Cardeña, 2006; Carpenter, 2004). Besides measuring these processes, future projects may also manipulate them to help advance our understanding.

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Changements dans l'État de Conscience et le Psi dans les Conditions Ganzfeld et Hypnose

Résumé. Dans une précédente expérimentation avec des participants à l'hypnotisabilité élevée (les Élevés) et basse (les Bas), les scores z psi avaient des corrélations modérées à fortes avec la croyance des percipients quant à leur succès et leurs précédentes expériences psi supposées, le vécu d'un état modifié de conscience et d'autres modifications de la conscience durant une session de Ganzfeld non-psi, mais seulement chez les sujets Élevés. La présente étude préenregistré avait un nombre N plus élevé de sujets Élevés, évalués dans les procédures d'hypnose et d'hypnose + Ganzfeld. Les participants (N = 35) servaient de « récepteurs » dans deux sessions de Ganzfeld et d'hypnose durant 20 minutes, dans un ordre contrebalancé. Les deux sessions utilisaient des verbalisations hypnotiques, mais seule l'une des deux employait l'homogénéisation sensorielle. Les auteurs servaient d'« émetteurs » et d'« expérimentateurs » dans différents immeubles. Pour mesurer les vécus de modifications de la conscience, les participants remplissaient l'Inventaire de phénoménologie de la conscience (PCI), au début et à la fin des sessions, et donnait une évaluation entre 0 et 100 à quatre clips vidéo (l'un étant la cible), d'où on dérivait des scores z psi. De manière globale, les participants n'ont pas eu des scores supérieurs au hasard et il n'y a eu aucune différence entre les conditions. Toutefois, pour les scores psi des sessions Ganzfeld, nous avons observé une corrélation modérée ($r = .40$, $p = .02$) avec les scores de transition en état modifié du PCI (Ganzfeld – scores de base). Bien que le score psi global n'était pas significatif, nous avons trouvé une relation entre le score psi et le vécu d'un état modifié dans les sessions de Ganzfeld psi.

Veränderungen im Bewusstseinszustand und Psi unter Ganzfeld- und Hypnosebedingungen

Zusammenfassung. In einem früheren Experiment mit Teilnehmern mit hoher (Highs)- und niedriger (Lows)-Hypnotisierbarkeit korrelierten die Psi-z-Scores mäßig bis stark mit den Überzeugungen der Perzipienten hinsichtlich ihres Erfolgs, ihren früheren mußmaßlichen Psi-Erfahrungen, Erfahrungen von Veränderten Bewusstseinszuständen und anderen Bewusstseinsveränderungen während einer Ganzfeld-Sitzung ohne Psi, allerdings nur bei den Highs. Die aktuelle vorregistriert Studie hatte ein größeres

N von nur Highs, die in Hypnose- und Hypnose + Ganzfeld-Verfahren bewertet wurden. Die Teilnehmer ($N = 35$) dienten als „Empfänger“ in zwei 20-minütigen Ganzfeld- oder Hypnosesitzungen in ausbalancierter Reihenfolge. Beide Sitzungen verwendeten Hypnose-Verbalisierungen, aber nur eine von ihnen hatte eine sensorische Homogenisierung. Die Autoren fungierten als „Sender“ und „Experimentator“ in verschiedenen Gebäuden. Als Index für den Grad der Bewusstseinsveränderungen füllten die Teilnehmer zu Beginn und am Ende der Sitzungen den Fragebogen zur Phänomenologie des Bewusstseins (PCI) aus und stufen von 0-100 4 Filmclips ein (einer davon war das Zielobjekt), aus denen Psi-z-Scores abgeleitet wurden. Insgesamt schnitten die Teilnehmer nicht besser als der Zufall ab, und es gab auch keinen Unterschied zwischen den Bedingungen. Bei den Ganzfeld-Sitzungen korrelierten die Psi-Scores jedoch mäßig ($r = .40$, $p = .02$) mit den PCI-Scores Shift Veränderter Zustand (Scores Ganzfeld-Basis). Obwohl das Gesamt-Psi-Ergebnis nicht signifikant war, fanden wir in den Ganzfeld-Psi-Sitzungen eine Beziehung zwischen den Psi-Scores und dem Erleben eines veränderten Zustands.

Cambios en el Estado de Consciencia y Psi en Ganzfeld e Hipnosis

Resumen. En un experimento anterior con participants con hipnotizabilidad alta (Altos) o baja (Bajos), las puntuaciones psi z mostraron correlaciones moderadas a fuertes con la creencia de los perceptores en su éxito y sus presuntas experiencias psi previas, y con experimentar un estado alterado de consciencia y otras alteraciones de consciencia durante una sesión ganzfeld, pero solo entre los Altos. Este estudio pre-registrado tuvo una N mayor de solo Altos, evaluados en procedimientos de hipnosis e hipnosis + ganzfeld. Los participantes ($N = 35$) sirvieron como “receptores” en dos sesiones de 20 min de ganzfeld o hipnosis en orden alterna. Ambas sesiones utilizaron verbalizaciones de hipnosis, pero solo una de ellas tuvo homogeneización sensorial. Los autores sirvieron como “remitente” y “experimentador” en diferentes edificios. Como índice de alteraciones experimentadas de la consciencia, los participantes completaron el Inventario de Fenomenología de la Consciencia (PCI) al comienzo y al final de las sesiones, y otorgaron una calificación de 0-100 a 4 fragmentos de película (uno de ellos el objetivo), de lo que derivamos puntajes psi z. En general, los participantes no obtuvieron mejores puntuaciones que el azar y no hubo diferencias entre las condiciones. Sin embargo, para las sesiones de ganzfeld las puntuaciones psi correlacionaron moderadamente ($r = .40$, $p = .02$) con las puntuaciones de cambio del estado alterado de PCI (ganzfeld - puntajes de referencia). Aunque la tasa general de psi no fue significativa, encontramos una relación entre la puntuación de psi y experimentar un estado alterado en las sesiones de psi en ganzfeld.