

Does Psi Exist? Lack of Replication of an Anomalous Process of Information Transfer

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D. J. Bem and C. Honorton (1994) recently presented in this journal a set of ganzfeld extrasensory perception (ESP) experiments conducted by C. Honorton that appeared to support the existence of a communication anomaly. In this article, the authors present a meta-analysis of 30 ganzfeld ESP studies from 7 independent laboratories adhering to the same stringent methodological guidelines that C. Honorton followed. The studies failed to confirm his main effect of participants scoring above chance on the ESP task, Stouffer $z = 0.70$, $p = .24$, one-tailed; M effect size ($z/N^{1/2}$) = 0.013, $SD = 0.23$. The new studies included replication attempts of 3 out of 5 internal effects reported as statistically significant by D. J. Bem and C. Honorton. Only 1 was confirmed, and the authors found that D. J. Bem and C. Honorton were mistaken in describing the original effect as being statistically significant. The authors conclude that the ganzfeld technique does not at present offer a replicable method for producing ESP in the laboratory.

Bem and Honorton (1994) recently presented data in *Psychological Bulletin* that appeared to support the existence of psi¹: “anomalous processes of information or energy transfer such as telepathy or extrasensory perception that are currently unexplained in terms of known physical or biological mechanisms” (p. 4).

Their data consisted of a set of extrasensory perception experiments using the ganzfeld, a mild sensory habituation environment. Ganzfeld psi experiments usually involve two participants—a sender and a receiver—located in separate rooms. The receiver is placed into the ganzfeld environment. The sender is then shown a target such as a picture postcard or video clip that has been randomly selected from a large pool of possible targets. The sender is asked to psychically communicate this target to the receiver. During this time, the receiver reports the images that come into his or her mind. The receiver is then shown a randomly ordered target set that contains the actual target and three decoy targets. The receiver examines each target and chooses the one that best matches the images experienced during the response period. The receiver scores a hit if he or she chooses the actual target and a miss if he or she selects a decoy. By chance alone, receivers should select the actual target 25% of the time. A statistically significant deviation above this baseline, maintained across a database of studies, is taken to indicate a communication anomaly.

Bem and Honorton outlined the history of ganzfeld research in parapsychology. They described how Hyman (1985), a critic of

parapsychology, reviewed 42 ganzfeld studies conducted between 1974 and 1981. He found that overall they produced statistically significant results but concluded that their findings could be accounted for by methodological flaws. In reply, Honorton (1985) argued that the studies, although not perfect, nevertheless supported the existence of psi. The debate ended with Hyman and Honorton (1986) coauthoring an article in which they concluded

We continue to differ over the degree to which the effect constitutes evidence for psi, but we agree that the final verdict awaits the outcome of future experiments conducted by a broader range of investigators and according to more stringent standards (p. 351).

Bem and Honorton went on to describe a new set of partly automated ganzfeld studies—autoganzfeld studies—carried out by Honorton between 1982 and 1989. These studies were designed to comply with the methodological standards agreed on by Hyman and Honorton. The resulting database consisted of 11 separate studies, with a total of 240 participants providing 354 trials. Conservatively excluding the 11th study, whose results may have been inflated because of response bias, Bem and Honorton calculated that the first ten studies achieved a statistically significant overall hit rate of 35% ($p = .002$, one-tailed). In addition, they pointed out that the data contained interesting internal effects, with a number of variables correlating significantly with performance on the psi task.

Although Bem and Honorton thought the autoganzfeld results sufficiently impressive to bring them to the attention of the wider community of psychologists, they ended their report on a cautious note, stating:

The autoganzfeld studies by themselves cannot satisfy the requirement that replications be conducted by a “broader ranger of investi-

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¹ As Bem and Honorton note, use of the term *psi* is merely descriptive and neither implies that any such anomalous phenomena are paranormal nor connotes anything about their underlying mechanisms.

gators." Accordingly, we hope that the findings reported here will be sufficiently provocative to prompt others to try replicating the psi ganzfeld effect (p. 13).

Most parapsychological laboratories with an interest in extrasensory perception research have conducted ganzfeld studies in the 10 years since the publication of Hyman and Honorton's (1986) guidelines. We are now therefore in a position to discover whether a "broader range of investigators" has successfully replicated the autoganzfeld results while paying the same attention to methodological stringency. This article presents a review of these new ganzfeld studies.

The New Studies

Only studies that began in 1987 or later (the date established by writing to the authors, if necessary) and published by February 1997 when our survey was completed were included in our analysis in order that the studies' designers would have had access to Hyman and Honorton's (1986) guidelines for ganzfeld research. As with the earlier studies before them, the 11 autoganzfeld studies varied considerably in procedure, so it would not have been possible to restrict the meta-analysis to examining exact replication attempts of the autoganzfeld work, nor is it known which, if any, procedures that might have been common to all of the autoganzfeld studies might have been crucial to success, ruling out the possibility of seeking a database of studies that replicated the autoganzfeld studies in their essentials. We therefore decided in advance to follow Honorton's approach to ganzfeld meta-analysis of both the early studies and his own autoganzfeld studies (Honorton et al., 1990; Hyman, 1985) of including in our database all psi studies that used the ganzfeld technique. The literature search covered the main parapsychology journals and the proceedings of parapsychology's main international annual convention, that of the Parapsychological Association. No attempt was made to find unpublished studies. Thirty studies were retrieved, appearing in 14 papers by 10 different principal authors from 7 laboratories.² Altogether, the database contained 1,198 individual trials.

Main Effect

A z score³ was obtained for each study and used to calculate its effect size ($z/N^{1/2}$), where N is the number of trials in the study. The cumulated probability of all the studies, calculated (as specified in advance) by the Stouffer method, gave a nonsignificant $z = 0.70$, $p = .24$, one-tailed. The mean effect size was 0.013 ($SD = 0.23$). Table 1 shows the number of trials, z score, and effect size for each study.

Internal Effects

The new ganzfeld studies examined three variables out of five that Bem and Honorton noted as relating statistically significantly to psi scores in the autoganzfeld studies. In the autoganzfeld studies, trials with dynamic targets had been more successful than trials with static targets. Novices (participants without prior ganzfeld experience) who reported prior psi experiences in everyday life and novices who reported studying a mental discipline such as meditation or yoga scored higher than those who did not. Despite having sample sizes comparable to or exceeding those of the auto-

Table 1
Number of Trials, z Score, and Effect Size ($z/N^{1/2}$) for Each Study in the New Ganzfeld Database

Study	Trials	z score	Effect size
Bierman (1995) Series III	40	1.94	0.31
Bierman (1995) Series IV	36	1.33	0.22
Bierman et al. (1993) Series I	50	0.03	0.00
Bierman et al. (1993) Series II	50	-0.30	-0.04
Broughton & Alexander (1996) FT1	50	-0.30	-0.04
Broughton & Alexander (1996) FT2	50	-1.33	-0.19
Broughton & Alexander (1996) EC1	51	1.81	0.25
Broughton & Alexander (1996) CLAIR1	50	-0.64	-0.09
Broughton & Alexander (1996) GEN1	8	0.46	0.16
Dalton (1994)	29	1.76	0.33
Johansson & Parker (1995) Study 1	30	-0.83	-0.15
Johansson & Parker (1995) Study 2	30	1.25	0.23
Johansson & Parker (1995) Study 3	30	1.25	0.23
Kanthamani & Broughton (1994) Series 3	40	-0.91	-0.14
Kanthamani & Broughton (1994) Series 4 ^a	65	2.01	0.25
Kanthamani & Broughton (1994) Series 5a ^b	4	0.22	0.11
Kanthamani & Broughton (1994) Series 5b	10	-2.06	-0.65
Kanthamani & Broughton (1994) Series 6a	20	-0.46	-0.10
Kanthamani & Broughton (1994) Series 6b	40	0.52	0.08
Kanthamani & Broughton (1994) Series 7	46	0.03	0.00
Kanthamani & Broughton (1994) Series 8	50	0.03	0.00
Kanthamani & Palmer (1993)	22	-2.17	-0.46
McDonough et al. (1994)	20	1.02	0.23
Morris et al. (1993) Study I	32	1.78	0.31
Morris et al. (1993) Study II ^a	32	-0.17	-0.03
Morris et al. (1995)	97	1.67	0.17
Stanford & Frank (1991)	58	-1.24	-0.16
Williams et al. (1994)	42	-2.30	-0.35
Willin (1996a)	100	-0.33	-0.03
Willin (1996b)	16	-0.24	-0.06

Note. FT1 = First Timers First Experimental Series; FT2 = First Timers Second Experimental Series; EC1 = Emotionally Close First Timers Series; CLAIR1 = Clairvoyance Series; GEN1 = General Series.

^a Values for this study differ slightly from those presented in an earlier version of this article presented at the Parapsychological Association 40th Annual Convention held in Brighton, England, August 1997, because of correction of a transcription error. ^b Too few trials were carried out for the reported single-mean t tests reported to be appropriate (Palmer, 1986, p. 148), so a single nonparametric outcome measure similar to one of the authors' analyses, namely, the mean sum of ranks for the four trials (Solfvin, Kelly, & Burdick, 1978), was calculated from the published data to give an estimate of the study's outcome.

ganzfeld studies, the new studies confirmed the effects of only one variable, that of having studied a mental discipline (Table 2).

² Confusion in correspondence with the authors concerning the starting date of Kanthamani and Broughton's (1994) Series 2 led to its erroneous inclusion in an earlier version of this paper presented at the Parapsychological Association 40th Annual Convention held in Brighton, England, August 1997. Its removal reduces the overall Stouffer z very slightly.

³ For each study that used the usual method of measuring its outcome by comparing the number of hits obtained to the number expected by chance, a z score was derived from an exact binomial test. Some studies used different outcome measures involving ranking or rating the target and decoys, and in such cases the probability associated with the test statistic used (t test, etc.) provided the z score. When a study reported more than one main outcome measure, the mean z score represented the study's outcome.

Table 2
Success of New Ganzfeld Studies in Confirming Internal Effects of the Autoganzfeld Studies

Variable and studies	<i>r</i> or <i>phi</i> ^a	<i>N</i>	<i>z</i> ^a	Stouffer <i>z</i> ^a for variable
Dynamic vs. static targets				
Broughton & Alexander (1996)	-.09	151	-0.95	-0.67
Morris et al. (1993) Study 2	.00	32	0.00	
Mental disciplines (novices only)				
Bierman et al. (1993)	.17	91	1.34	2.24*
Broughton & Alexander (1996)	-.02	151	-0.07	
Kanthamani & Broughton (1994)	.08	182	0.87	
Morris et al. (1993) Study 1	.44	32	2.33	
Previous psychic experiences (novices only)				
Broughton & Alexander (1996)	.02	151	0.04	0.59
Kanthamani & Broughton (1994)	.06	182	0.60	
Morris et al. (1993) Study 1	.07	32	0.38	

^a Negative values indicate that the effect was in the opposite direction to that obtained in the autoganzfeld studies.

* $p = .013$, one-tailed.

The difference between the results of the autoganzfeld studies and the new ganzfeld database is striking. The new studies did not confirm the statistically significant main effect of the autoganzfeld studies and replicated only one internal effect out of the three examined.

These findings could be interpreted in one of two ways. One possibility is that the autoganzfeld results may have been methodological or statistical artifacts, and the new studies failed to replicate their findings because they were better controlled. Alternatively, the autoganzfeld studies could have been conducted under conditions that were conducive to psi and to the demonstration of internal effects, whereas the new ganzfeld studies were not. These explanations are explored in turn.

Were the Autoganzfeld Effects Spurious?

Methodological Rigor

Although the autoganzfeld studies were designed to rule out problems found in early ganzfeld research, a number of potential pathways for sensory leakage, albeit very weak leakage, have been identified in them. Honorton pointed out that there was some very low-level auditory leakage to the receivers' headphones of the soundtracks of the dynamic targets on about 80% of the trials with such targets (Honorton et al., 1990). Wiseman, Smith, and Kornbrot (1996) suggested that the experimenters, who on each trial read the receivers' mentation back to them after the response period, may have been unknowingly nonblind to the target's identity because of potentially inadequate auditory shielding between experimenter and sender. Other minor potential flaws have been raised by Morris, Cunningham, McAlpine, and Taylor (1993). It is difficult to conduct conclusive internal analyses to determine whether any of these individual potential information pathways had any impact in the experiments, for a variety of reasons. For example, the impact, if any, of the headphone leakage problem cannot be conclusively assessed because the modification of the equipment that removed the problem overlapped in time with the

introduction of a new procedure of having experimenters help and advise receivers during the target selection process, itself a possible new source of sensory leakage if the experimenters were unknowingly nonblind to the target. More generally, some of the other potential pathways identified were present throughout the studies, and some comparisons of subsets of trials that might otherwise be informative have low statistical power (Wiseman et al., 1996). Of those analyses conducted to attempt to shed some light on the question, some have offered support for the action of such pathways, and others have tended to refute them (Honorton et al., 1990; Wiseman et al., 1996). None of the opportunities for sensory leakage appear sufficiently strong, however, to explain away the positive results of the autoganzfeld in any immediately compelling way, and it is clear that Honorton and his research team went to considerable lengths to attempt to provide adequate sensory shielding.

Statistical Procedures Used for Internal Effects

We reexamined the analyses that provided evidence for the autoganzfeld's five statistically significant internal effects. The analyses concerning target type, previous psi experiences of novice ganzfeld participants, and a positive correlation between extraversion and psi scores appeared sound. However, the analyses indicating relationships between psi performance for ganzfeld novices and two characteristics of those novices—having studied a mental discipline and high ratings on Feeling and Perception on the Myers-Briggs Type Indicator (MBTI; Briggs & Myers, 1957)—present some problems of interpretation.

Details of the latter two analyses are reported in two papers (Honorton, 1997; Honorton & Schechter, 1986), both concerning attempts to identify variables that might predict the performance of novice participants in the autoganzfeld. Honorton and Schechter (1986) described exploratory analyses of the effects of 27 variables on psi performance in two novice studies combined. They used an explicit strategy of selecting post hoc only variables that appeared to have been successful in moderating the main effect as candidates for confirmation in later studies and recommended that the statistically significant findings from the exploratory analyses should be treated as suggestive until such confirmation took place. Honorton (1997) reported the confirmation attempt, which consisted of examining three subsequent novice studies combined.

Examining Honorton (1997) and Honorton and Schechter's (1986) accounts of the novice study analyses, we found that it is unclear why Bem and Honorton (1994) reported that the performance of novice participants in the autoganzfeld studies was significantly predicted by involvement with mental disciplines. For the first two novice series combined, a higher proportion of hits was obtained by participants who had studied a mental discipline than by those who had not, but the difference was nonsignificant (Honorton & Schechter, 1986), and its direction reversed in the next three studies combined (Honorton, 1997). This variable was the only one confirmed by the new ganzfeld studies as having a statistically significant relationship to ganzfeld performance, yet there appears to be no good evidence for the original effect.

Receivers classified as FP in the first two novice studies were identified in Honorton and Schechter's (1986) exploratory analyses as scoring significantly higher on the ganzfeld task than other novices (Fisher's exact $p = .0011$). The FP grouping was one of many

possible combinations of the MBTI scales, and the MBTI scales themselves were only 4 of 27 variables examined, so it appears very possible that this result was an artifact of multiple analysis. The relationship was not confirmed in the second set of series (Honorton, 1997) so again it is not clear why Bem and Honorton (1994) reported this variable as bearing a statistically significant relationship to psi performance in the novice autoganzfeld studies.

Did the New Ganzfeld Studies Use Psi-Conductive Procedures?

To discover whether the new ganzfeld studies were carried out under conditions that would be expected to promote the appearance of a psi effect, we examined whether the new studies matched the autoganzfeld studies in the frequency with which they used participants or procedures that Bem and Honorton considered to be associated with ganzfeld success.

As we have already discussed, Bem and Honorton reported five statistically significant internal effects in the autoganzfeld studies. Although we have argued that the evidence for two of the novice effects is unconvincing, there remain the three effects relating to extraversion, novice psi experience, and target type (dynamic vs. static). Bem and Honorton also stressed the importance of three additional variables—participants' belief in the existence of psi, their creative or artistic ability, and a "warm social ambiance" (1994, p. 11) during testing. Although Bem and Honorton did not conduct internal analyses of the autoganzfeld database with respect to these three variables, they pointed out that the parapsychological literature indicates that both belief in psi and creativity are associated with success in psi tasks and that they believed that the warm social ambiance that Honorton strove to create in his laboratory throughout the studies was an important determinant of success. We now examine in turn each of these potentially important variables—extraversion, novice psi experience, target type, belief in psi, creativity, and social ambiance—to determine whether studies in the new database at least matched the autoganzfeld studies in the degree to which they exploited them.

Extraversion

In the autoganzfeld studies, participants' extraversion was measured using the Extraversion/Introversion scale of the MBTI. Scores above 100 on this scale indicate introversion. Autoganzfeld participants scored a mean of 100.36 ($SD = 25.18$), indicating that they were not an unusually extravert population. However, we cannot tell whether the new ganzfeld studies matched this level of extraversion because only one study reported the participants' mean MBTI extraversion score.

Novice Psi Experience

Ninety-three percent of the novice autoganzfeld participants (Honorton, 1997) reported having had at least one personal experience of psi. Among the new ganzfeld studies, two sets of studies reported the percentage of novice participants who claimed to have had a psi experience, and in both sets the percentages were quite high at 91% for Broughton and Alexander's (1996) First Timers First and Second Experimental Series and Emotionally Close First Timers Series combined and 80% in Kanthamani and Broughton's

(1994) studies. However, in the absence of wider reporting of such data, it is impossible to tell whether the other new ganzfeld studies achieved similar figures.

Target Type

In the autoganzfeld studies, 50% of the trials used dynamic targets, a figure almost matched by the new ganzfeld studies. Excluding two studies using music as targets that cannot clearly be classified as typically dynamic or static, at least 42% and possibly as many as 47% of trials in the new database used dynamic targets.

Belief in Psi

Bem and Honorton noted that the autoganzfeld participants had an unusually high average level of belief in psi. On a 7-point scale, where 1 = *strong disbelief* and 7 = *strong belief*, their mean rating was 6.20. Several experimenters in the new ganzfeld database reported that they attempted to recruit participants with a positive attitude toward psi, but it is impossible to tell how well they succeeded because only one study reported its participants' mean belief rating.

Creativity

On 6% of the autoganzfeld trials, participants were recruited from the Juilliard School of Performing Arts, a group who scored particularly highly in the ganzfeld task. In 9% of trials in the new ganzfeld studies, the experimenters reported having recruited participants from creative populations, so the new database appears to slightly exceed the autoganzfeld studies in terms of drawing participants from creative populations. Participants' creativity was not measured in the autoganzfeld studies, nor was it reported in most of the new ganzfeld studies, so we cannot determine whether the autoganzfeld studies on average had participants who were more creative than those in the new studies. However, there is some indication that the autoganzfeld participants may have been especially creative on average. The autoganzfeld novices scored unusually high on intuitiveness on the MBTI Sensing/Intuition scale ($M = 127.92$), a measure likely to be related to creativity.

Social Ambiance

Honorton et al. (1990) reported that the experimenters attempted to create a friendly and informal social atmosphere throughout the autoganzfeld studies. Of the new ganzfeld studies, only 68% reported an attempt to create a warm social ambiance, for example, by sitting down to chat with the participants to get to know them before the session or offering them refreshments. The new studies may therefore not have matched the autoganzfeld studies in this respect, but it is also possible that attention to atmosphere was paid in all of the new studies but not reported by all.

Conclusion

The new ganzfeld studies show a near-zero effect size and a statistically nonsignificant overall cumulation. Out of three autoganzfeld internal effects that the new database examined, only one effect was replicated, and it turns out to have been mistakenly reported by Bem and Honorton (1994) as having been statistically significant in the autoganzfeld studies.

This failure to replicate could indicate that the autoganzfeld's results were spurious, with the main effect having been due to very weak sensory leakage and the statistically significant internal effects resulting from correlations between psychological variables and performance in detecting weak sensory stimuli in some cases and from an explicitly exploratory strategy of post hoc data selection or mislabeling of a nonsignificant effect in others. Alternatively, the differences in outcome between the autoganzfeld studies and the new database could have been due to the latter not being carried out under psi-conducive conditions. Although the two sets of studies used dynamic and static targets on approximately the same proportions of trials, not enough detail is reported for us to assess whether the new studies matched the autoganzfeld studies in terms of participants' extraversion, novices' psi experiences, belief in psi, creativity, and the provision of a warm atmosphere. It is also possible that other procedural differences that we have not examined may have played a role; neither the autoganzfeld studies nor the new ganzfeld database constitutes a procedurally homogeneous set that would make the question of replication a straightforward issue.

Whatever the reason, the autoganzfeld results have not been replicated by a "broader range of researchers." The ganzfeld paradigm cannot at present be seen as constituting strong evidence for psychic functioning.

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