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RESEARCH ARTICLE

Revisiting the Ganzfeld ESP Debate: A Basic Review and Assessment

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Abstract—This paper presents a brief review of the debate between parapsychologists and skeptics regarding the issue of replication in experimental tests of extrasensory perception (ESP) using a sensory reduction technique known as ganzfeld. The review is followed by a basic assessment of 59 ganzfeld ESP studies reported in the period following the publication of a stringent set of methodological guidelines and recommendations by R. Hyman and C. Honorton in 1986. The assessment indicates that these 59 studies have a combined hit rate of approximately 30%, which is significantly above the chance expected hit rate of 25%. A comparison of the hit rates across four ganzfeld meta-analyses, as well as across fifteen laboratories, seems to further indicate replication of the ganzfeld ESP effect by a broad group of independent researchers.

Keywords: extrasensory perception (ESP)—ganzfeld—meta-analysis—psi—parapsychology

Introduction

In attempting to make a case for the existence of ostensible psychic (psi) phenomena such as extrasensory perception (ESP), parapsychologists have been regularly faced with the challenge from skeptics of providing a body of notable evidence that can be reproduced under laboratory conditions. In rising to this challenge, many parapsychologists have focused in recent years on the data from a particular type of experiment often used to test for telepathy, and which makes use of a sensory reduction technique known as ganzfeld.

Within the context of parapsychology, the ganzfeld (German for "total field") is a technique intended to help improve the reception of ESP by briefly exposing a person to a static and uniform sensory field.[1] This is done by covering the person's eyes with translucent eye shields (usually halved ping-pong balls externally illuminated by a red light) and filling the person's ears with soft static noise played through headphones. While in this homogeneous ganzfeld "state," the person may report a dimming of the visual field and experience a diffuse background that has been described as a "cloudy fog" (Wackermann, Pütz, & Allefeld, 2008:1366). After several minutes, the person may begin to experience hallucinatory-like images and/or sounds, similar to those experienced during the hypnagogic state between wakefulness and sleep.[2] Presumably, if the ESP assumption is valid, some of the images and sounds may correspond to the ESP target.

A typical experimental test session for telepathy using the ganzfeld proceeds in the following manner: Two participants, one acting as the "sender" and the other as the "receiver,"[3] are isolated in separate, soundproofed rooms. In one room, the receiver is placed in the ganzfeld state and asked to describe any images, sounds, or impressions that come to mind while in that state. In the other room, the sender is shown a randomly selected visual target, such as a photograph or a video clip, and asked to concentrate on its details. After about thirty minutes, the receiver is taken out of the ganzfeld and shown a collection of four photos or video clips, one of which was the target that the sender was concentrating on (the other three are decoys). The receiver is then asked to rank the four photos/videos according to their degree of correspondence with the images, sounds, and impressions received while in the ganzfeld. If the photo/video that the sender was viewing is ranked as having the highest degree of correspondence, the test session is considered a success, or a "hit." With the probability of a hit being 1 in 4, the hit rate expected by chance is 25% (for further discussion of the ganzfeld and its use in ESP experiments, see, for example, Bem & Honorton, 1994, Honorton, Berger,Varvoglis, Quant, Derr, et al., 1990, Wackermann, Pütz, & Allefeld, 2008).[4]

For a period of approximately 28 years, there has been an ongoing debate between parapsychologists and skeptics over the issue of whether or not the ganzfeld experiment can provide the independently replicable evidence necessary to support the empirical case for psi. This paper seeks to address the issue in two ways. First, it provides a brief review of the substance of the debate as it has persisted from 1982 to the present. Second, it presents a basic assessment of a collection of 59 ganzfeld ESP studies reported in the years following the publication of a stringent set of methodological guidelines and recommendations for ganzfeld research developed by Ray Hyman, a cognitive psychologist and long-time critic of parapsychology, and the late Charles Honorton, a parapsychologist and contributor to the ganzfeld database (Hyman & Honorton, 1986).

The Ganzfeld Debate

ESP research using the ganzfeld was initiated in the early 1970s largely through the efforts of three independent researchers: Charles Honorton, William Braud, and Adrian Parker (Braud, Wood, & Braud, 1975, Honorton & Harper, 1974, Parker, 1975). Between 1974 and 1981, a total of 42 ganzfeld studies had been reported by ten different laboratories. Of these early studies, 23 (55%) produced results that were statistically significant at the .05 level.

The debate commenced at the 25th Annual Convention of the Parapsychological Association (PA) in August of 1982, where two preliminary meta-analyses of the early ganzfeld database were presented.[5] On the basis of his analysis, Ray Hyman argued that the initial rate of successful replication may have been overestimated. Noting that some of the experiments contained slight variations on the standard ganzfeld procedure, Hyman suggested that each variation should be counted as a separate study. By his count, there were 80 ganzfeld studies in all, 25 of which (31%) were successful. Although this was still considered notable, Hyman further argued that the significance of the database could be further discounted through the effects of selective reporting.

In his review of the database, Hyman found a significant tendency for studies with a small number of test sessions to have a higher proportion of significant positive results, suggesting to him the possibility that some studies may have been stopped and reported early on because of their promising results (i.e. optional stopping on a hit). In addition, Hyman claimed that there was circumstantial evidence suggesting that some pilot or exploratory studies in the database were being retrospectively counted as formal ones solely on the basis of their significant outcomes. He further suggested that, in contrast to the significant ones, studies with nonsignificant results might not have been reported, contributing to a possible "file-drawer" effect. According to Hyman's argument, when the effects of selective reporting are taken into account, the success rate of the database comes much closer to chance. Lastly, Hyman cited a number of potential study flaws in the database relating to target randomization, adequate security, sensory cuing, statistical errors, and the use of multiple analyses.

Honorton responded to Hyman's critique with his own meta-analysis of the early ganzfeld database. To address the issue of varying conditions, Honorton proposed that researchers should examine each study and decide for themselves whether or not each varying ganzfeld condition should be classified as a separate study. To adjust the results for the effects of multiple analyses, Honorton applied a Bonferroni correction and showed that the initial success rate would only be reduced to 45%. To further counter the multiple-analysis argument, Honorton focused on the 28 studies that reported a hit rate, the most common analysis measure used in the database. Of these, 12 studies (43%) were significant at the .05 level. When combined, these 28 studies were shown to have a Stouffer's Z of 6.60 ($p = 2.1 \times 10^{-9}$). In addition to citing the PA's policy against selective reporting, Honorton used Rosenthal's (1979) "file drawer" estimation statistic to show that approximately 423 studies would be needed to nullify the significance of the 28 studies, amounting to 15 unreported studies for every one that was reported. Lastly, to address the issue of flaws, Honorton's analysis showed that there was no significant correlation between rated study quality and experimental outcomes.

The two opposing meta-analyses were refined and published together in the *Journal of Parapsychology* three years later (Honorton, 1985, Hyman, 1985). Instead of remaining in opposing camps, Hyman and Honorton (1986) came together soon afterward to develop a "joint communiqué" that highlighted the issues on which they agreed. In summarizing their agreements, they wrote:

> We agree that there is an overall significant effect in this data base that cannot be reasonably explained by selective reporting or multiple analysis. 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)

To supplement their agreement regarding future experimentation, Hyman and Honorton (1986) also provided in their communiqué the jointly developed set of methodological guidelines and recommendations.

At the same time, Honorton and his colleagues at Psychophysical Research Laboratories (PRL) in New Jersey had designed a series of automated ganzfeld studies in which target selection, presentation, and data recording were handled by computer (Honorton et al., 1990). These eleven "autoganzfeld" studies were conducted from 1983 to 1989, and were made to be compliant with the guidelines and recommendations of the joint communiqué. In a meta-analysis published in the prominent mainstream journal *Psychological Bulletin*, Daryl Bem and Charles Honorton (1994) evaluated ten of the PRL autoganzfeld studies and found that they had collectively produced 106 hits in 329 test sessions for a significant hit rate of 32.2% ($z = 2.89$, $p = .002$). A graphical summary of Bem and Honorton's results is shown in Figure 1.

In addition to PRL, seven other laboratories had made efforts to design and conduct ganzfeld studies that complied with the joint communiqué guidelines and recommendations. Five years after the analysis by Bem and Honorton, Julie Milton and Richard Wiseman (1999) published a meta-analysis in *Psychological Bulletin* of the 30 ganzfeld studies conducted by these other laboratories between 1987 and 1997. Their analysis seemed to indicate that this independent database had produced an overall result consistent with chance (Stouffer's $Z = 0.70$, $p = .242$). A graphical summary of Milton and Wiseman's results is shown in Figure 2.

Two years later, Lance Storm and Suitbert Ertel (2001) published a

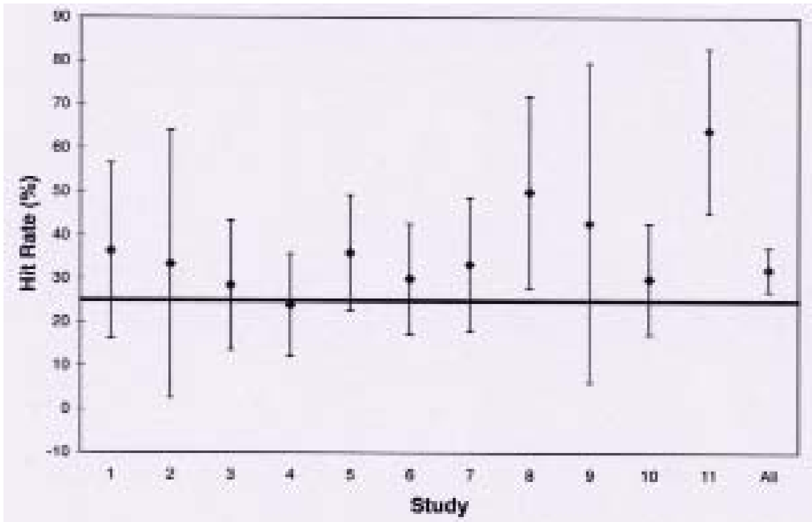

Figure 1. Results summary of the PRL autoganzfeld meta-analysis reported by Bem and Honorton (1994), in terms of hit rate and 95% confidence intervals.
The horizontal line at 25% indicates the hit rate expected by chance. The far right hit rate marked "All" represents the combined data of Studies 1–10.

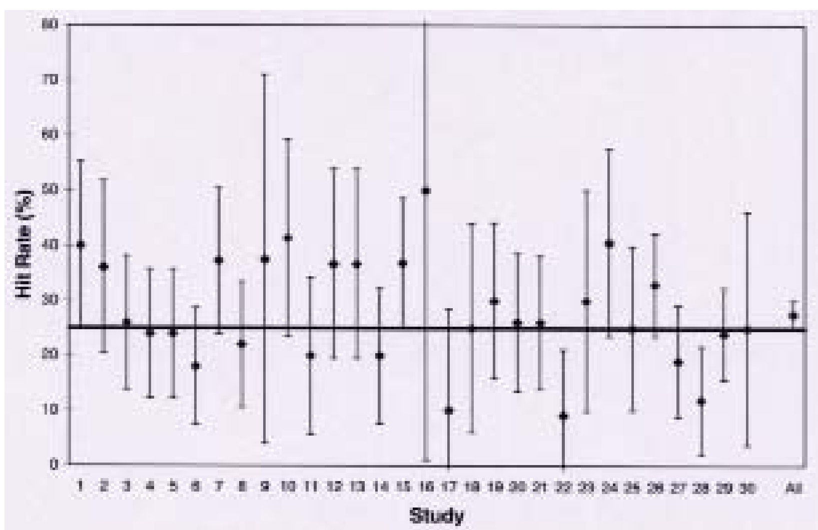

Figure 2. Results summary for the 30 ganzfeld ESP studies analyzed by Milton and Wiseman (1999), in terms of hit rate and 95% confidence intervals.
The horizontal line at 25% indicates the hit rate expected by chance.

commentary in *Psychological Bulletin* that raised several methodological issues with Milton and Wiseman's analysis, and that presented a meta-analysis of a larger database. They reasoned that, in order to reach a general conclusion on ganzfeld research, it was necessary to consider the results of all studies reported from 1974 to 1997. On this basis, they compiled a unified database of 79 studies that included the early ganzfeld and PRL studies, along with those contained in the Milton–Wiseman database. Their subsequent analysis found a significant overall effect (Stouffer's $Z = 5.66$, $p = 7.78 \times 10^{-9}$). In their reply, Milton and Wiseman (2001) claimed that Storm and Ertel's result was ambiguous because they had included the early ganzfeld database, which contained numerous flaws according to Hyman's (1985) analysis. Milton and Wiseman argued that this would make it impossible to determine what proportion of the significant effect was due to flaws.

Shortly after this exchange, Daryl Bem, John Palmer, and Richard Broughton (2001a) published a meta-analysis that seemed to shed light on a possible reason why Milton and Wiseman's results were null. They noticed that the database used by Milton and Wiseman comprised two types of study, labeled "standard" and "non-standard."

Standard studies were intended to be direct replications of the PRL autoganzfeld, and had therefore used methods and procedures very similar to (if not the same as) those used by PRL. In contrast, non-standard studies used methods and procedures that had been purposely modified from those commonly used in previous ganzfeld experiments in order to search for other psi-conducive conditions and begin exploring the processes involved in ESP. Some of the modifications made in non-standard studies include using auditory targets instead of visual ones (Willin, 1996a, 1996b), using more than one target during a session (Serial Ganzfeld section in Parker & Westerlund, 1998), exploring the effects of psychedelic drugs on receiver impressions (Series V & VI in Wezelman & Bierman, 1997), and exclusively using a clairvoyance design throughout the course of the study (Kanthamani & Broughton, 1996, Kanthamani & Khilji, 1990, Kanthamani, Khilji, & Rustomji-Kerns, 1989).

Several of the non-standard studies were noted by Bem et al. (2001a) to have shown negative or null results, consistent with their cautionary statement that ". . . such deviations from exact replication are at increased risk for failure" (p. 208). They hypothesized that, when combined with the standard studies, the results of the non-standard studies could have the effect of reducing the overall hit rate. To test this, Bem et al. separately grouped the two types of study based on ratings of how closely they adhered to the PRL autoganzfeld methods and procedures. The 29 standard studies were found to have a significant above-chance hit rate of 31.2% (Stouffer's $Z = 3.49$, $p = .0002$), whereas the nine non-standard studies had a nonsignificant below-chance hit rate of 24%

(Stouffer's $Z = -1.30$, $p = .903$). The difference between the two study types was significant ($U = 190.5$, $p = .020$). In addition, Bem, Palmer, & Broughton (2001a) found ten other ganzfeld studies that had been reported after Milton and Wiseman's analysis. When these studies were combined with the 30 studies in the Milton–Wiseman database, a significant hit rate of 30.1% was obtained (Stouffer's $Z = 2.59$, $p = .0048$). Graphical summaries of Bem et al.'s results are presented in Figure 3, Figure 4, and Figure 5.

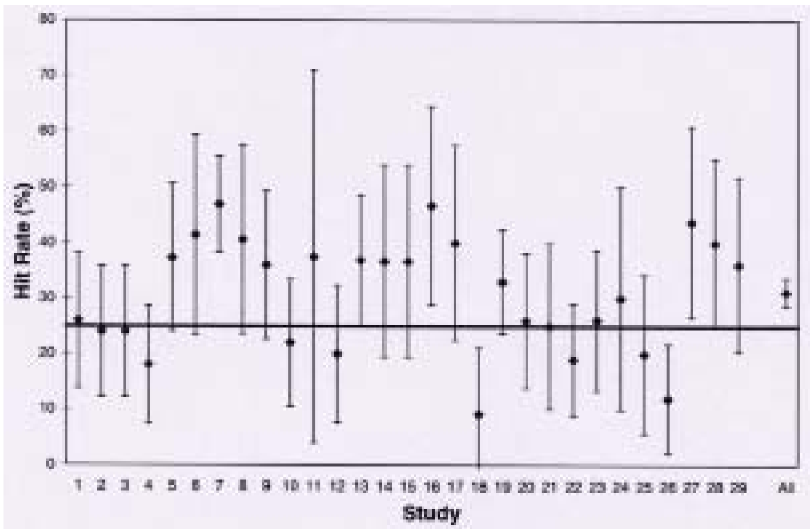

Figure 3. Results summary for the set of 29 "standard" ganzfeld studies contained in the database analyzed by Bem et al. (2001b), in terms of hit rate and 95% confidence intervals.
The horizontal line at 25% indicates the hit rate expected by chance.

Two other recent meta-analyses have reported overall hit rates that are significantly above the 25% expected by chance. In the first, Marilyn Schlitz and Dean Radin (2003) found that a unified database of all ganzfeld studies published between 1974 and 2001 had a hit rate of 32% (929 hits in 2,878 sessions, $z = 8.75$, $p << 10^{-15}$).[6]

Another unified database comprising 16 early ganzfeld studies, the eleven PRL autoganzfeld studies, and Bem et al.'s 29 "standard" ganzfeld studies was analyzed by Jessica Utts, Michelle Norris, Eric Suess, and Wesley Johnson (2010) in the second study. Their results indicated 709 hits in 2,124 sessions for a hit rate of 33.4% ($z = 8.92$, $p = 2.26 \times 10^{-18}$). In addition to this frequentist

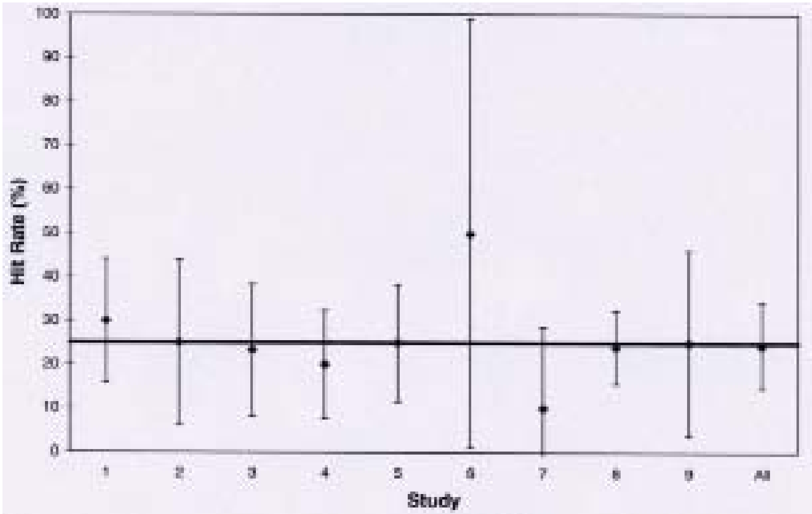

Figure 4. Results summary for the set of nine "non-standard" ganzfeld studies contained in the database analyzed by Bem, Palmer, & Broughton (2001b), in terms of hit rate and 95% confidence intervals.
The horizontal line at 25% indicates the hit rate expected by chance.

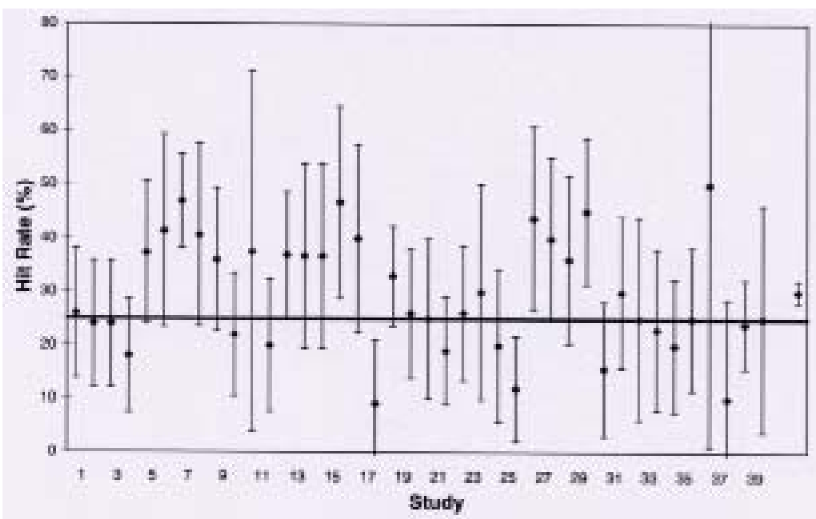

Figure 5. Results summary for the entire set of 40 "standard" & "non-standard" ganzfeld studies contained in the database analyzed by Bem, Palmer, & Broughton (2001b), in terms of hit rate and 95% confidence intervals.
The far right point interval represents the overall hit rate for all 40 studies combined. The horizontal line at 25% indicates the hit rate expected by chance.

analysis, Utts, Norris, Suess, & Johnson (2010) performed a Bayesian analysis on this database to illustrate how the differing levels of a priori belief regarding the probability for ganzfeld success (modeled in terms of a beta distribution) for three separate personal points of view (believer, skeptic, and open-minded) were each influenced by the experimental results of the database. While the probability distribution for the open-minded view was shifted more toward higher probabilities of success, the distribution for the skeptic view was not shifted much from probabilities close to chance level. The distribution for the believer view remained within the range of higher probabilities, but was found to have less variability.

Most recently, an analysis by Lance Storm, Patrizio Tressoldi, and Lorenzo Di Risio (2010a) of 30 ganzfeld studies reported from 1997 to 2008 found a hit rate of 32.2% (483 hits in 1,498 sessions, $z = 6.44$, $p < .001$).[7] A graphical summary of Storm et al.'s (2010a) results is shown in Figure 6.

More in-depth discussion of the ganzfeld debate and additional summaries of the meta-analyses reviewed here can be found in other published reviews by Dalkvist (2001), Palmer (2003), Radin (1997, Ch. 5, 2006, Ch. 6), Storm (2006), and Utts (1991, 1999b).

A Basic Assessment

An issue central to the ganzfeld debate as it appeared in *Psychological Bulletin* was the status of independent replication in the years following the publication of Hyman and Honorton's (1986) joint communiqué. At the end of their article on the PRL autoganzfeld meta-analysis, Bem and Honorton (1994) stated that, although they had produced significant overall results under stringent conditions,

> . . . the autoganzfeld studies by themselves cannot satisfy the requirement [in the joint communiqué] that replications be conducted by a "broader range of investigators." Accordingly, we hope the findings reported here will be sufficiently provocative to prompt others to try replicating the psi ganzfeld effect. (p. 13)

The analysis by Milton and Wiseman (1999) represented an initial attempt to determine whether this requirement had been met in the decade following the joint communiqué, and their null result suggested that the outlook for replication by others was not promising. In contrast, several subsequent analyses using a unified database of all ganzfeld studies seemed to suggest that a more positive outlook was warranted (Radin, 2006:120–121, Schlitz & Radin, 2003, Storm & Ertel, 2001, Storm et al., 2010a:477, Utts, Norris, Suess, & Johnson, 2010). Despite this, it might be argued that these analyses may be somewhat limited in their ability to address the issue because of their inclusion of the early ganzfeld database. Assuming for the moment that the early database does indeed contain serious flaws, as argued by Hyman (1985), the argument can be made that inclusion of this database could potentially inflate or otherwise confound the overall results.[8] Meta-analyses that used a non-unified database also offer a positive outlook on the issue (e.g., Bem, Palmer, & Broughton, 2001a, Storm et al., 2010a:475), although assessing the broader, long-term trend in replication may be partially limited in these analyses by their confined periods of coverage. For these reasons, an attempt was made to basically assess the post-communiqué replication status of the current ganzfeld database, as well as to update and confirm some of the results of previous meta-analyses. However, it should be made clear that the assessment presented here was not meant to represent any kind of formal meta-analysis, and thus that may perhaps limit interpretation of its findings (addressed in the Discussion).

Method

To examine the current status of replication, a collection of ganzfeld studies was compiled from the databases listed in three previously published meta-analyses that addressed post-communiqué research (Bem, Palmer, & Broughton, 2001a, Milton & Wiseman, 1999, Storm et al., 2010a). This resulted in 59 studies reported in the period between 1987 and 2008 (see Appendix 1).

Formal meta-analyses of ganzfeld research have tended to use effect size as their primary measure of effect magnitude. However, to make the assessment results more accessible to a general interdisciplinary audience, the decision was made here to focus on hit rate, as this is a concept that is intuitively easier to grasp. Following the approach taken by Radin (1997), the hit rate was obtained by determining the proportion of hits achieved over the total number of test sessions in each study, and an associated 95% confidence interval was calculated based on the proportion of hits and its associated standard deviation (*SD*), derived from the equation (from Utts, 1999a:341):

$$SD = \sqrt{(h)(1 - h)/N}$$

where h is the proportion of hits and N is the number of sessions. To cover 95% of the values that fall within approximately two standard deviations of h, SD is multiplied by 1.96. Thus, the confidence interval is obtained using the equation $CI = h \pm 1.96(SD)$ (Howell, 1995:95–96, Utts, 1999a:341). To confirm and compare previously obtained results, the published data from four meta-analyses (Bem & Honorton, 1994, Bem et al., 2001a, Milton & Wiseman, 1999, Storm et al., 2010a) were reanalyzed in the same manner.

To test the statistical significance of the collection and the four databases, the method of hypothesis testing described by Utts (1999a, Ch. 21) was used. In this basic four-step method, a test statistic is used to decide between two competing hypotheses: a null hypothesis and an alternative hypothesis. Under the null hypothesis of no ESP, the mean hit rate in ganzfeld experiments is expected to be around the chance rate of 25%. Under the alternative hypothesis of ostensible ESP, the mean ganzfeld hit rate will be significantly different from the expected chance rate of 25%. Here, the test statistic was a *z*-score of the form $z = (x - \mu)/SD$, where x is the proportion of hits observed in a given database of ganzfeld experiments, μ is the mean proportion of hits expected under the null hypothesis (.25), and *SD* is the expected standard deviation (determined by the *SD* equation above, using the chance-expected proportion of hits for *h*). Based on the resulting *z*-score, an associated probability value was obtained to determine the degree of significance. Because the prediction in many ESP tests (including the ganzfeld) is for an above-chance hit rate, the same prediction was maintained here and thus all reported probability values are one-tailed.

Results

Figure 1 shows a results summary of the PRL autoganzfeld meta-analysis by Bem and Honorton (1994), expressed in terms of hit rate and 95% confidence intervals. As in the Bem and Honorton analysis, Study 11 (No. 302–Experienced) was excluded from the overall hit rate because of its possible response bias. As noted in the previous section, Bem and Honorton found a total of 106 hits in 329 sessions, for a significant overall hit rate of 32.2%. Based on Utts' method of hypothesis testing, this results in a *z*-score of 3.02 ($p = .001$), which is slightly higher than, but still consistent with, the original reported finding.[9]

Figure 2 shows the results summary for the 30 post-communiqué ganzfeld studies analyzed by Milton and Wiseman (1999), expressed in terms of hit rate and 95% confidence intervals. It was noted in the previous section that Milton and Wiseman's analysis, as originally published, had produced a result consistent with chance. However, a few researchers (Radin, 2006:118, Schlitz & Radin, 2003:79, Utts cited in Storm et al., 2010a, Footnote 1) have pointed out that if their 30-study database is analyzed in terms of hit rate, a significant finding is obtained. An attempt was made to verify this by calculating the proportion of hits for each study in the database and then examining the combined hit rate.[10] This resulted in 331 hits in 1,198 sessions for a hit rate of 27.6% ($z = 2.08$, $p = .019$), consistent with the estimates made by these other researchers. It can be seen at the far right of Figure 2 that the lower bound of the confidence interval for the combined hit rate seems to include chance (by calculation, the lower bound is 25.07%, just marginally above chance expectation). This suggests that, even though the result is postive, caution is warranted in interpreting the combined result.

Results summaries for the meta-analysis by Bem, Palmer, & Broughton (2001a) are shown in Figure 3, Figure 4, and Figure 5. These summaries are based on data contained in a corrected table that was later published by the authors (Bem, Palmer, & Broughton, 2001b). Figure 3 shows the results for the set of 29 "standard" ganzfeld studies contained within their 40-study database. There were 402 hits out of 1,278 sessions in this set of standard studies, for an overall hit rate of 31.5%. By the Utts method, this is associated with a *z*-score of 5.37 ($p = 3.95 \times 10^{-8}$).

The results for the set of nine "non-standard" ganzfeld studies in the Bem et al. database is shown in Figure 4. As in the Bem et al. (2001a) analysis, the two studies in the database that fell on the boundary between standard and non-standard were excluded. Consistent with the point made by Bem, Palmer, & Broughton (2001a) that studies that deviate from standard ganzfeld methods and procedures are at greater risk for failure, the confidence intervals for all nine studies shown in Figure 4 include chance expectation, even when combined. This is further indicated by a nonsignificant hit rate of 24.3% for this set (73 hits in 300 sessions,[11] $z = -0.28$, $p = .610$).

When combined, the 40 standard and non-standard studies contained in the Bem, Palmer, & Broughton (2001b) database have an above-chance hit rate of 30.1% (503 hits in 1,661 sessions, $z = 4.80$, $p = 7.94 \times 10^{-7}$). However, there has been some debate about the effect of including a large and highly significant study by Kathy Dalton (1997), which apparently began over the considerable influence it had in affecting the overall significance of the ganzfeld database as it stood in March of 1999 (see Milton, 1999, Schmeidler & Edge, 1999, Storm, 2000). When this Dalton study is excluded from the Bem, Palmer, & Broughton (2001a) database, the overall hit rate decreases to 28.9%, which remains significant (443 hits in 1,533 sessions, $z = 3.53$, $p = .0002$). The results for all 40 studies are shown in Figure 5.

Figure 6 shows the results summary for 29 of the 30 ganzfeld studies analyzed by Storm et al. (2010a).[12] Ten studies contained within their database were also included in the database of Bem et al. (2001b). Here a small update is provided to the Storm et al. database by replacing the preliminary data from one conference-presented study (Ganzfeld Study 7 in Storm et al.'s Appendix A) with its more complete published data (Parker, 2010), and adjusting one study (Ganzfeld Study 11 in their Appendix A) for an extra hit that was later found and reported elsewhere (Parker, 2000). As noted in the previous section, Storm et al. reported a significant overall hit rate of 32.2% for their database, a finding that does not include the Dalton (1997) study. Recalculating based on the updated database gives 486 hits in 1,506 sessions for an overall hit rate of 32.3% ($z = 6.54$, $p = 3.09 \times 10^{-11}$), consistent with their finding.

A summary of the combined results for the collection of 59 post-

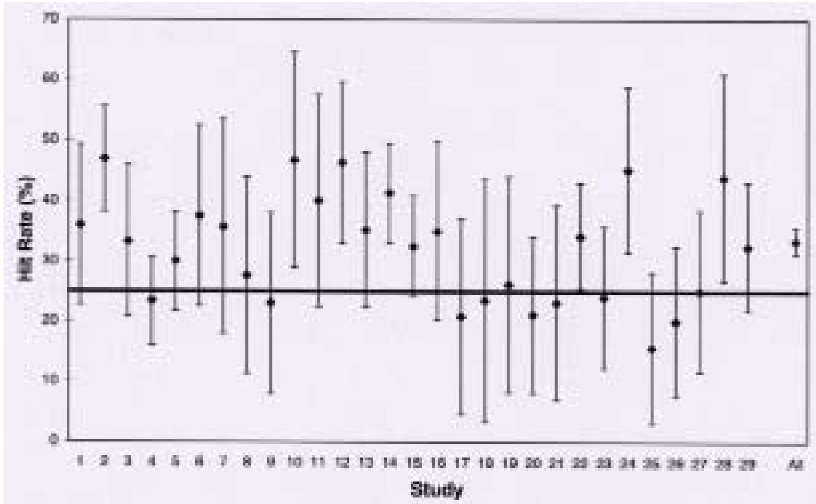

Figure 6. Results summary for 29 of the 30 ganzfeld studies included in the meta-analysis by Storm et al. (2010a), in terms of hit rate and 95% confidence intervals.
The horizontal line at 25% indicates the hit rate expected by chance.

communiqué studies compiled from the databases of Bem et al. (2001b), Milton and Wiseman (1999), and Storm et al. (2010a) is shown in Figure 7 in terms of a cumulative hit rate over time and associated 95% confidence intervals (modeled after the approach taken by Radin, 2006:120). It should be made clear that this does not include the PRL autoganzfeld results; it is based only on ganzfeld replication efforts independent of PRL. The graph indicates that the hit rate begins to average out over time at about 30%, significantly above the 25% expected by chance. Overall, there are 878 hits in 2,832 sessions for a hit rate of 31%, which has $z = 7.37$, $p = 8.59 \times 10^{-14}$ by the Utts method. If the Dalton (1997) study is excluded, there are 818 hits in 2,704 sessions for a hit rate of 30.3% ($z = 6.36$, $p = 1.01 \times 10^{-10}$). This suggests that, even if the early ganzfeld and PRL autoganzfeld databases are not considered, attempts to replicate the ganzfeld ESP effect by independent researchers are still collectively above what would be expected by chance, with the correct target being identified about one-third of the time on average.

The Issue of Replication: A Comparative Approach

Statistician Jessica Utts (1999b) suggests that, rather than being defined in terms of statistical significance, "[a] more appropriate definition of repeatability of an effect is that the estimated magnitude of the effect (odds ratio, hit rate, and so on)

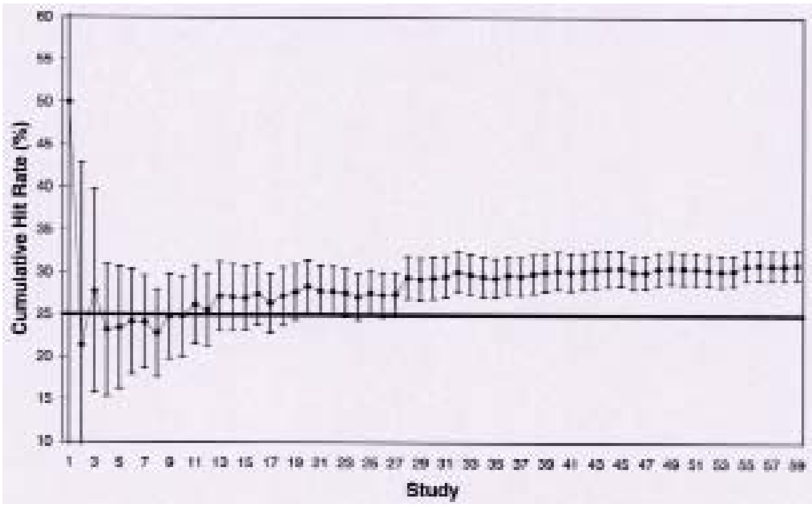

Figure 7. Results summary for the collection of 59 post-communiqué ganzfeld ESP studies reported from 1987 to 2008, in terms of cumulative hit rate over time and 95% confidence intervals.
The horizontal line at 25% indicates the hit rate expected by chance.

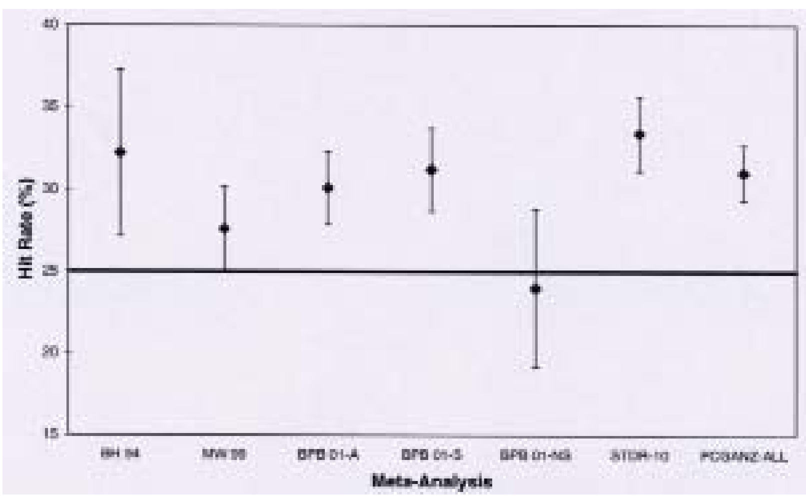

Figure 8. Comparison of the overall hit rates and 95% confidence intervals from four ganzfeld ESP meta-analyses.
The horizontal line at 25% indicates the hit rate expected by chance.
BH 94: Bem & Honorton, 1994; MW 99: Milton & Wiseman, 1999; BPB 01-A: combined result from all studies in the Bem et al. (2001b) database; BPB 01-S & BPB 01-NS: results from the "standard" and "non-standard" studies in Bem et al., 2001b, respectively; STDR-10: Storm et al., 2010a; PCGANZ-ALL: combination of MW 99, BPB 01-A, and STDR-10, representing all post-communiqué ganzfeld studies, excluding PRL.

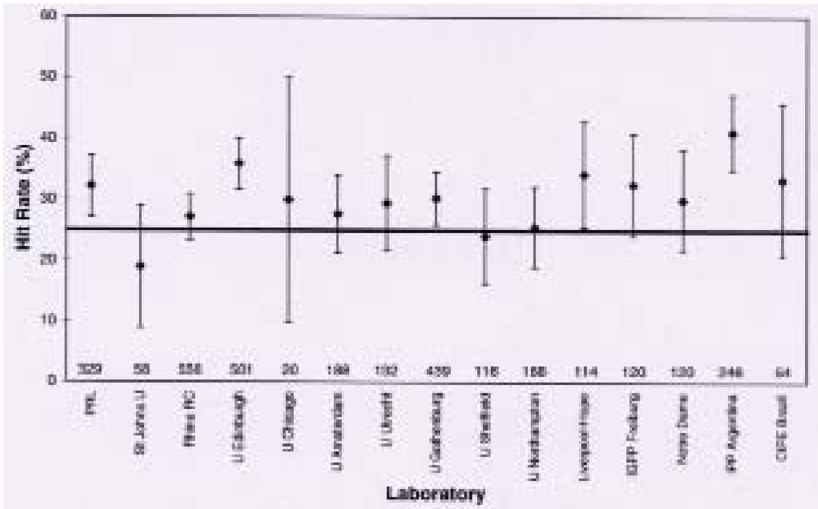

Figure 9. Comparison of the hit rates and 95% confidence intervals for 15 laboratories that have contributed to the ganzfeld ESP database. The horizontal line at 25% indicates the hit rate expected by chance. Above each lab is the total number of sessions contributed by that lab to the database.

falls within the same range from one repetition of an experiment to the next" (p. 631). This is something that can be assessed by looking at the confidence intervals. Figure 8 shows a comparison of the hit rate confidence interval from the Bem and Honorton (1994) PRL autoganzfeld database with the confidence intervals of the three meta-analyses used to compile the 59-study collection (Bem et al., 2001b, Milton & Wiseman, 1999, Storm et al., 2010a).

It can be seen that, when compared to the PRL autoganzfeld (BH 94 in Figure 8), the three other meta-analyses each have a mean hit rate that lies within the PRL 95% confidence interval. The same finding is evident when the results of the three analyses are combined. When split into standard and non-standard ganzfeld, the Bem et al. (2001b) database indicates that, as one might predict, the mean hit rate for standard studies replicates the PRL autoganzfeld finding, while the non-standard hit rate mean does not (although the confidence intervals do overlap).

Looking at replication from another perspective, Figure 9 compares the mean hit rates and confidence intervals across each of the fifteen laboratories that have contributed to the ganzfeld database.[13] While the intervals for most of the laboratories include chance, they also have mean hit rates above what is expected by chance. Most importantly, ten of the fifteen laboratories (66.7%) produced mean hit rates that fall at or within the bounds of the 95% confidence interval for PRL, indicating a fair degree of replication of the obtained PRL hit rate.

Discussion

The results of the basic assessment presented here are consistent with those reported in previous meta-analyses of the ganzfeld ESP database, and seem to indicate three main things: First, there remains a significant overall hit rate in the series of ganzfeld studies conducted after Hyman and Honorton's (1986) joint communiqué.

Second, this significant finding remains apart from the results of the early ganzfeld and PRL databases. As noted, this goes toward addressing a criticism that could be leveled against meta-analyses that include the latter two databases as part of a larger unified database. In addition to his finding of flaws in the early ganzfeld database, Hyman (1994) claimed to have found subtle hints of artifacts present in the PRL autoganzfeld database that he argues may constrain interpretation of its results. Assuming his claims have merit, it can be argued that inclusion of the two databases in a unified database could potentially confound interpretation of any subsequent meta-analysis. However, in not being reliant on either of the databases, the collection of post-communiqué studies used in the present assessment circumvents this confound.

Third, this series of post-communiqué studies was contributed by fifteen different laboratories, more than half of which produced a hit rate statistically within the range of the hit rate obtained in the PRL autoganzfeld. Similarly, the combined series shows a comparable hit rate to PRL. If the replication issue is addressed in these terms, it would seem that, in answer to Hyman and Honorton's (1986:351) communiqué statement, the psi ganzfeld effect has indeed been replicated by "a broader range of investigators" under stringent standards.

Some consideration should be made of the potential limitations of the present assessment. Because it was not defined in advance to be a formal meta-analysis, the assessment had no well-defined criteria for studies to be included in the collection used here, and no formal check of the heterogeneity of the dataset was performed. However, it should be recognized that the studies included in the collection came from meta-analytic databases that did have defined inclusion criteria, and that the issue of how to properly handle a heterogeneity problem within the ganzfeld database is still under debate (e.g., see Schmeidler & Edge, 1999:340–349, Storm, 2000). Even so, at least one formal meta-analysis that included a test for heterogeneity has found a significant result with a trimmed, homogeneous database (Storm et al., 2010a:475).

As mentioned previously, the ganzfeld debate has persisted for nearly 30 years without adequate resolution. If the results of the present assessment and those of previous meta-analyses are carefully considered, they seem to stress the issue that there is a statistical anomaly within the ganzfeld database that is in need of a more sufficient explanation, if not ESP. Regardless of their interpretation, the results seem to offer reason that serious consideration should perhaps be put toward bringing final closure to the replication issue at the heart of the debate, rather than lingering endlessly on the proof-oriented questions of whether an anomaly exists and whether it is replicable.

Notes

[1] The idea of how the ganzfeld might improve ESP reception is based on the assumption that ESP is regularly overwhelmed or "drowned out" by incoming signals from the prime sensory channels of vision and hearing. However, if these sensory channels are reduced via the ganzfeld, then this might give the subtle ESP information a better chance of seeping into conscious awareness.

[2] The similarity between the ganzfeld state and the hypnagogic state has previously led some researchers to suspect that the two might be related. However, the findings reviewed by Wackermann et al. (2008) suggest that, rather than being a state of reduced awareness like the hypnagogic state, the ganzfeld may actually be a mildly active state, characterized in part by brain waves in the alpha range (8–12 Hz, usually associated with a state of relaxed awareness). Some studies offer evidence to suggest that ESP may be associated with alpha activity (see the reviews in Krippner & Friedman, 2010), perhaps suggesting a possible connection.

[3] Although the concept of telepathy traditionally assumes that the sender is "transferring" information about the ESP target to the receiver, there is currently little (if any) evidence to indicate that that is what is occurring. Thus, these terms are being used here for the convenience of distinguishing between the two participants, and should not be taken to imply that one necessarily transferred or "sent" something to the other.

[4] In addition to telepathy, a ganzfeld experiment may also be used to test for clairvoyance; this can be done by having no sender present to view the ESP target. Although a small number of the individual experiments in the ganzfeld database have tested clairvoyance, the majority of them have used a telepathy design.

[5] For simplicity, meta-analysis can be defined here as the statistical method of combining the data from many separate experiments in order to examine and weigh the evidence for a combined overall effect, rather than looking at the individual results of each experiment alone. This type of analysis is particularly useful when evaluating the experimental evidence for phenomena that are inherently weak or that tend to vary across conditions, such as psi and other forms of human behavior. For useful discussions on meta-analysis and its use in parapsychology, see Radin (1997, Chapter 4), Storm (2006), and Utts (1991, 1999b).

[6] See also two books by Radin (1997:86–89, 2006:120–121) for the results of two other unified ganzfeld meta-analyses.

[7] The ganzfeld was one of the three types of ESP experiment examined in Storm et

al.'s (2010a) meta-analysis. The other two, noise reduction induced through alleged psi-enhancing techniques (dreams, meditation, relaxation, and hypnosis) and standard waking free response, had also shown significant overall results.

[8] The issue of whether or not the early ganzfeld database does indeed contain serious flaws remains to be one of serious controversy; it was a major point of contention in the exchange between Milton and Wiseman (2001, 2002) and Storm and Ertel (2001, 2002) with regard to interpreting the latter's meta-analysis, and Hyman (2010:488) still apparently stands behind his argument of flaws (see Storm et al., 2010b:493, for a brief counterargument and supporting references). Although some analyses have found no significant correlation between rated study quality and effect size, one wonders whether this would satisfy the skeptics, given the persistent controversy. Rather than having to address it, the controversy was circumvented here by considering only the ganzfeld studies conducted after the joint communiqué (since the focus of this paper is on post-communiqué replication).

[9] The discrepancy between the *z*-score obtained by the Utts method and that reported by Bem and Honorton (1994) can be explained by the fact that the latter is associated with the exact binomial probability for the observed number of hits compared to chance expectation (p. 10). The same holds for the results of all the other meta-analyses reanalyzed here.

[10] In calculating the number of hits for two studies contained in the Milton–Wiseman database, it was necessary to make approximations. For Stanford and Frank (1991), Bem et al. (2001b:428) note that the hit rate was not reported and had to be estimated from a *z*-score. The number of hits was approximated based on this hit rate and the total number of sessions. For McDonough, Don, & Warren (1994), the approximated number of hits was based on a composite of the hit rates obtained both by receiver judging and by independent judging. The approximations for the two studies are noted in the table in Appendix 1.

[11] For the serial study by Parker and Westerlund (1998) and four studies summarized by Kanthamani and Broughton (1994), Bem et al. (2001b:428) note that the hit rate was not reported and had to be estimated from a *z*-score. The number of hits for these studies was again approximated based on the estimated hit rate and the total number of sessions. These approximations are noted in Appendix 1.

[12] One of the studies (Roe & Flint, 2007) in the Storm et al. (2010a) database was excluded because it had a hit probability of 12.5% (i.e. 1 in 8) rather than the usual 25% (1 in 4) of most other ganzfeld studies.

[13] To identify these contributing laboratories, the methods sections of the individually published studies cited in Appendix 1 were consulted in order to determine where the ganzfeld test sessions for each study had been conducted. In some cases, this information was also given in the study title (e.g., the Utrecht and Amsterdam series), and/or was available in the extended Parapsychological Association Convention abstracts for certain studies that were originally published in the annual anthology *Research in Parapsychology* and later in the *Journal of Parapsychology*. The numbers of sessions reported in the studies were tabulated and grouped according to the laboratory where each study was conducted. The session numbers for all studies conducted at a given laboratory were then summed to produce the totals for each laboratory listed in Figure 9.

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APPENDIX 1
The 59-Study Post-Communiqué Ganzfeld Collection

Study	Study Description	*N* Sessions	Hits	Hit Rate	SD*
1	Kanthamani et al. (1989)—FRNM Manual Series 5a	4	**2**	0.500	0.250
2	Kanthamani et al. (1989)—FRNM Manual Series 5b	10	**1**	0.100	0.095
3	Kanthamani & Khilji (1990)—FRNM Manual Series 6b	40	**12**	0.300	0.072
4	Stanford & Frank (1991)—Psych Verbal Indicators	58	**11**	0.190	0.052
5	Kanthamani & Broughton (1996)—FRNM Manual Series 6a	20	**5**	0.250	0.097
6	Bierman et al. (1993)—Utrecht Novice Series 1	50	13	0.260	0.062
7	Bierman et al. (1993)—Utrecht Novice Series 2	50	12	0.240	0.060
8	Kanthamani & Palmer (1993)—Subliminal Sending	22	2	0.091	0.061
9	Morris et al. (1993)—Cunningham Study	32	13	0.406	0.087
10	Morris et al. (1993)—McAlpine Study	32	8	0.250	0.077
11	Dalton (1994)—Sender–Receiver Sex Pairing	29	12	0.414	0.091
12	Kanthamani & Broughton (1994)—FRNM Manual Series 3	40	8	0.200	0.063
13	Kanthamani & Broughton (1994)—FRNM Manual Series 4	65	24	0.369	0.060
14	Kanthamani & Broughton (1994)—FRNM Manual Series 7	46	12	0.261	0.065
15	Kanthamani & Broughton (1994)—FRNM Manual Series 8	50	13	0.260	0.062
16	McDonough et al. (1994)—EEG Ganzfeld	20	**8**	0.300	0.102
17	Williams et al. (1994)—Senders/Geomagnetism	42	5	0.119	0.050
18	Bierman (1995)—Amsterdam Series III: Emotional Targets	40	16	0.400	0.077
19	Bierman (1995)—Amsterdam Series IV: Emotional Targets	36	13	0.361	0.080
20	Morris et al. (1995)—Sender/No Sender	97	32	0.330	0.048
21	Willin (1996a)—Musical Targets	100	24	0.240	0.043
22	Willin (1996b)—Musical Targets High Scorers	16	4	0.250	0.108
23	Broughton & Alexander (1997)—AG II: First Timers Series 1	50	12	0.240	0.060
24	Broughton & Alexander (1997)—AG II: First Timers Series 2	50	9	0.180	0.054
25	Broughton & Alexander (1997)—AG II: Emotionally Close	51	19	0.373	0.068
26	Broughton & Alexander (1997)—AG II: Clairvoyance Series	50	11	0.220	0.059
27	Broughton & Alexander (1997)—AG II: General Series	8	3	0.375	0.171
28	Dalton (1997)—Creativity and Psi	128	60	0.469	0.044
29	Parker et al. (1997)—Gothenburg Study 1	30	6	0.200	0.073
30	Parker et al. (1997)—Gothenburg Study 2	30	11	0.367	0.088
31	Parker et al. (1997)—Gothenburg Study 3	30	11	0.367	0.088
32	Symmons & Morris (1997)—7 Hz Drumming	51	23	0.451	0.070
33	Wezelman & Bierman (1997)—Amsterdam Series IVB: Emotional	32	5	0.156	0.064
34	Wezelman & Bierman (1997)—Amsterdam Series V: Altered States	40	8	0.200	0.063
35	Wezelman & Bierman (1997)—Amsterdam Series VI: Altered States	40	10	0.250	0.068
36	Wezelman et al. (1997)—Eigensender	32	14	0.438	0.088
37	Parker & Westerlund (1998)—Gothenburg Serial Study	30	**7**	0.230	0.077
38	Parker & Westerlund (1998)—Gothenburg Study 4	30	14	0.467	0.091
39	Parker & Westerlund (1998)—Gothenburg Study 5	30	**12**	0.400	0.089
40	Alexander & Broughton (1999)—CL1 Ganzfeld	50	18	0.360	0.068
41	Roe et al. (2001)—Sender–Receiver Creativity Scores	24	5	0.208	0.083
42	da Silva et al. (2003)—Ganzfeld vs. No-Ganzfeld	54	18	0.333	0.064
43	Morris et al. (2003)—Creative Population	40	15	0.375	0.077
44	Roe et al. (2003)—Sender as PK Agent 1	40	14	0.350	0.075
45	Wright & Parker (2003)—Real-Time Digital Ganzfeld	74	24	0.324	0.054
46	Goulding et al. (2004)—First Real-Time Digital Ganzfeld Judging	128	30	0.234	0.037
47	Lau (2004)—Bayesian Ganzfeld Approach	120	36	0.300	0.042
48	Parra & Villanueva (2004)—Picture Targets	54	25	0.463	0.068
49	Parra & Villanueva (2004)—Musical Targets	54	19	0.352	0.065
50	Roe et al. (2004)—Sender Role: No Sender	17	4	0.235	0.103
51	Roe et al. (2004)—Sender Role: Sender	23	6	0.261	0.092
52	Stevens (2004)—Feedback Reinforcement	50	12	0.240	0.060
53	Sherwood et al. (2005)—Experimenter Interpersonal Psi	38	8	0.211	0.066
54	Parker (2006/2010)—Identical Twins	**28**	**10**	0.357	0.091
55	Parra & Villanueva (2006)—Ganzfeld vs. Relaxation	138	57	0.413	0.042
56	Pütz et al. (2007)—Covert Ganzfeld Telepathy	120	39	0.325	0.043
57	Simmonds-Moore & Holt (2007)—Schizotypy Trait & State	26	6	0.231	0.083
58	Parker & Sjödén (2008)—Subliminal Priming	29	8	0.276	0.083
59	Smith & Savva (2008)—Ganzfeld Experimenter Effects	114	39	0.342	0.044
All		**2832**	**878**	**0.310**	**0.009**

* Based on the equation given by Utts (1999a:341); see Method subsection in text. FRNM: Foundation for Research on the Nature of Man. AG: autoganzfeld. Bold indicates hits and sessions adjusted or approximated (see text; Notes 10 & 11). Studies 1, 2, 3, & 5 are summarized in Kanthamani & Broughton (1994).