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An Experiment with Covert Ganzfeld Telepathy

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Abstract

The aim of our study was to test a modified ganzfeld telephathy procedure, which conceals the intended anomalous information transfer. Forty pairs were recruited for ganzfeld sessions, each comprising three trials consisting of a 'communication' and a 'rating/reporting' phase. During the 'communication' phase (20 min), one member of the pair (A) was exposed to multimodal ganzfeld and reported her/his imagery, while the other (B) memorised a repeatedly presented video clip. In the 'rating/reporting' phase subject A rated the similarity of the 'target clip' and three 'decoys' to the ganzfeld imagery, while simultaneously subject B gave a written account of the content of the presented target. Trials in which the highest score was assigned to the target clip were considered as correct identifications. In 39 out of 120 trials (32.5%) the presented target clip was correctly identified ($p = .039$). Statistics based on ranks of all four video clips revealed no significant deviations from chance expectancy. The modified experimental procedure (a) yields correct identification rates comparable with the traditional procedure, (b) allows study of 'ganzfeld telepathy' without confronting subjects with an 'impossible task'.

Introduction

Dyadic communication in the ganzfeld ('ganzfeld telepathy') is an established paradigm in experimental parapsychology for the last few

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decades. The results of these experiments have often been considered as experimental evidence for an anomalous information transfer in the ganzfeld (Honorton, Berger, Varvoglis, Quant, Derr, Schechter & Ferrari, 1990; Bem & Honorton, 1994), although this conclusion was questioned by later meta-analyses (Milton & Wiseman, 1999).

Since the beginning of ganzfeld telepathy experiments in the early 1970s, the procedure has been repeatedly modified. These changes include the invention of an automated ganzfeld procedure ('autoganzfeld') through Berger and Honorton (1985) to overcome shortcomings related to the early ganzfeld experiments, in which manual target randomisation and ratings recording etc. were used, and use of dynamic targets (video clips). Some later studies based on an improved version of the automated ganzfeld procedure ('digital autoganzfeld') used multiple trials per session to increase the statistical power and to help identifying pairs able to establish anomalous communication. Four trials per session ('serial ganzfeld') were used by Parker and Westerlund (1998); Goulding, Westerlund, Parker and Wackermann (2004) used two trials per session.

Except for these modifications, ganzfeld telepathy experiments have several key elements in common which are of various, often unclear or disputable importance:

(a) Participants are usually fully aware of the intended anomalous information transfer. The subject in the ganzfeld attempts to 'receive' the video clip (or other target material) his/her partner watches, and the latter intends to 'transmit' the content of the video clip. Therefore, participants with a preconceived interest or belief in the 'paranormal' will perceive the task differently from participants without such beliefs, who may find the task strange, ridiculous, or may be facing a 'mission impossible' situation.

(b) The 'receiver' is allowed and/or encouraged to continuously verbalize her/his mentation, which is recorded for later evaluation. However, continuous verbalisation may be problematic for the following reasons. Firstly, the rationale for using ganzfeld in parapsychological research was to induce the allegedly psi-favourable 'internal attentional state' (Honorton, 1978). Indeed, prolonged exposure to ganzfeld stimulation frequently induces dream-like, pseudo-hallucinatory imagery. However, the continuous verbalisation may contaminate the genuine ganzfeld imagery, and it may even counter-act it altogether, diverting the subject towards thought fragments, free associations, and other cognitive processes. Secondly, if one wants to combine ganzfeld experiments with simultaneous measurements of the brain's electrical activity, continuous verbalisation would inevitably cause contamination of the EEG data with muscular artifacts.

(c) It has often been argued that targets of rich, variable, emotional content and dynamic character facilitate the 'psi' communication (Bem & Honorton, 1994; Parker, Grams, & Petterson, 1998); 'good targets' should be meaningful and have human interest (Watt, 1988). However, regarding the dynamic character, we should note that static targets (photographs or drawings) were used, reportedly with success, in early ganzfeld studies (Honorton, 1985a, 1985b). As to the content variability issue, we are facing contradictory claims: for example, in remote viewing research rather homogeneous stimulus material is preferred, which is based on the rationale that more homogenous stimuli lead to 'noise reduction' (May, Spottiswoode & James, 1994). Lantz, Luke and May (1994) reported a significant difference between static and dynamic targets, favouring static targets in a telepathy experiment. In another telepathy experiment (without sender), topically restrictive dynamic targets showed a significant increase of anomalous cognition compared to the unbounded dynamic target pool used in the previous experiment. We should add that the use of heterogeneous stimuli makes post hoc analyses of possible relations between stimulus content and anomalous information transfer rather difficult.

The aim of this explorative study was elaboration of an experimental protocol stripped down of most traditionally employed components. We opted for a 'minimalised' procedure which did:

(i) not disclose the intended anomalous information transfer and would be thus acceptable for all participants ('non-overt telepathy'); (ii) focus on the ganzfeld-specific imagery, avoid continuous verbalisation but allow comprehensive reporting of ganzfeld-induced experience; (iii) use sets of stimuli with maximal within-set content diversity, constructed from homogenous stimulus material, and based on an objective measure of stimulus content differences.

Of main interest was the performance of the participants in terms of target identification. All other reported statistics were post-hoc analyses.

Methods

Participants

Forty pairs (48 female, 32 male; mean age: 25.7 years, range: 16.8–55.3 years) were recruited for the experiment via the local university's job exchange service and a newspaper advertisement.

With one exception all participants were reportedly of good health and had no medical or neurological problems. The exception was a female participant who was subject to anticonvulsive medication against idiopathic grand mal seizures, but seizure free for the last two years. As the experiment did not involve EEG recordings, the pair was not excluded from the sample. One of the examined pairs were female twins (age: 22 years).[1]

The participants were not aware of the aim of the study, i. e. anomalous information transfer in the ganzfeld; the study was described in the advertisements as 'an experiment in perception and relaxation'. Before the experiment, the participants signed a written consent not to reveal the information about the study to a third party; they were informed about the proper intent of the study only after the experimental session.

Questionnaires and inquiries

A standard participant information form (PIF) was used to collect the subjects' sociodemographic data, their general mental and physical status and their medical history. A short status questionnaire was applied to assess their physical and mental condition immediately before the experiment.

To assess personality traits of the participants we used the *NEO Five Factor Personality Inventory* (Costa & McCrae, 1992) in a German translation by Borkenau & Ostendorf (1993), a questionaire which we also used in our earlier ganzfeld studies.

The relationship between the participants was assessed by a special response form: the duration of the relationship (years/month), the kind of relationship (acquaintance, friends, intimate friends, partner, spouse) and its intensity. The latter was measured by placing a mark on a 100 mm preprinted line segment, with endpoints labelled 0 (unknown) and 100 (maximum), and an anchor point at 10 mm = a person known from seeing, no acquaintance.

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[1] This pair participated in two sessions, but only the results of the first session were included into the data of the present study; details are given in the appendix.

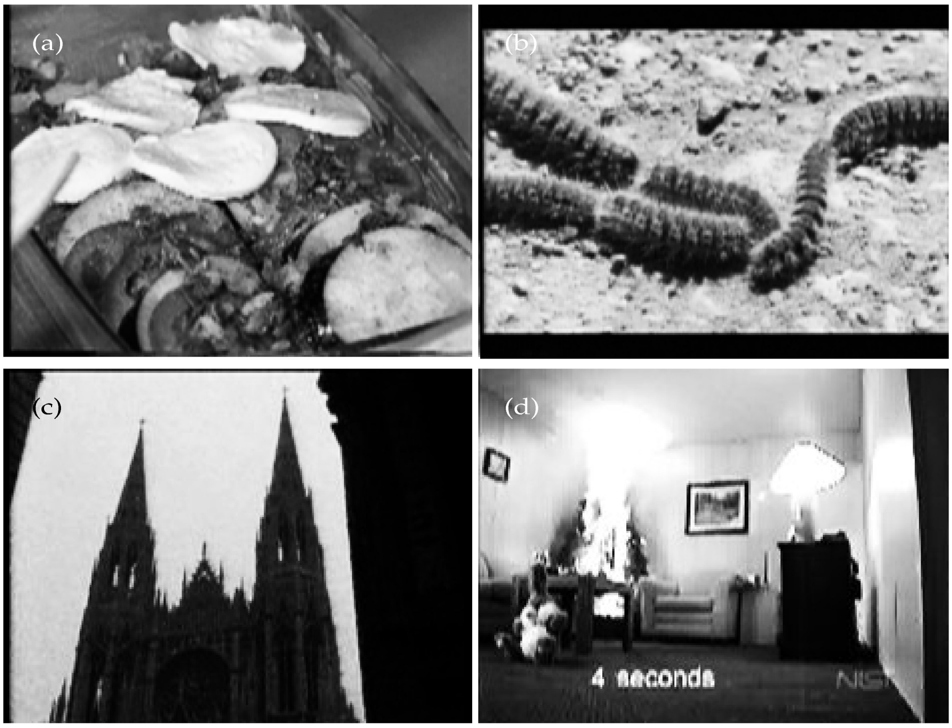

Figure 1. Example of a set of four video clips. Representative frames of the respective video sequences are shown: (a) Preparation of a meal (casserole) [content code: HumArtNat]; (b) train of crawling caterpillars [content code: AniEle(earth)]; (c) cathedral in the Normandy [content code: HumArc]; (d) burning Christmas tree [content code: ArcArtEle(fire)]. For detailed explanation of the content codes see text.

During the experimental sessions (see the experimental procedures section below) a shortened version of an inquiry developed in our laboratory (Pütz et al., 2006) was used, assessing sensory modalities involved in reported percepts, distinctness and vividness, and various other aspects of the reported ganzfeld imagery.

Stimulus material

A database of 82 video clips was collected from publicly available sources (Internet, video tapes libraries etc.), using the following selection criteria: (a) understandable and (prima faciae) interesting content, (b) content homogeneity, and (c) minimal duration 30 seconds. Clips fulfilling the above-given criteria were mostly taken from documentary movies.

The next step was grouping of selected video clips to groups of four (‘4-sets’) to be used in the experiments (in each trial, one clip served as the ‘target’ stimulus and the three remaining clips as ‘decoys’). A total of eight 4-sets were selected from the primary database, using the procedure described below (see, for example, Figure 1).

A stimulus content classification system (SCCS) was developed for the purpose of the present study and used to classify the contents of the database. The SCCS has six primary content categories: humans (Hum), animals (Ani), architecture (Arc), human-made objects or artefacts (Art), nature or natural sceneries (Nat) and 'elements of Nature' (Ele), i. e. fire, water, air, and earth.

Each clip is thus described by a 6-dimensional binary vector, $\mathbf{x} = (x_1, \ldots, x_6) \in \mathbb{B}^6$, where $\mathbb{B} \equiv \{0, 1\}$; 1 encodes presence and 0 encodes absence of the respective content category. The space of all possible combinations, $\mathbb{B}^6$, thus consists of $2^6 = 64$ elements. Contents difference between two video clips was measured by the Hamming distance,[2]

$$d_H(\mathbf{x}, \mathbf{y}) = \sum_{i=1}^{6} |x_i - y_i| \, ; \quad \mathbf{x}, \, \mathbf{y} \in \mathbb{B}^6 \, .$$

Contents diversity of a 4-set, $D(S)$, is defined as the sum of all possible pair-wise Hamming distances within the set,

$$D(S) = \frac{1}{2} \sum_{\mathbf{x}, \mathbf{y} \in S} d_H(\mathbf{x}, \mathbf{y})$$

(the maximal possible diversity per 4-set is 24).

An iterative optimisation procedure was used to generate 4-sets from the available database with (a) maximised contents diversity for each 4-set, (b) yielding as many 4-sets as possible. The database allowed a maximum of only six 4-sets reaching the maximal contents diversity, $D(S) = 24$. The aim was to maximise the overall contents diversity,

$$\mathcal{D} = \sum_{j=1}^{N} D(S_j) \, ,$$

while obtaining a sufficiently large pool of 4-sets. Balancing the pool size and diversity, the procedure resulted in eight 4-sets deviating only by 4.7% from the theoretical maximum of the overall contents diversity $\mathcal{D}$.

As shown in Table 1, the selection procedure compensates the non-uniformity of relative occurrences of the SCCS-categories in the available database, approximating the theoretical value 0.5 which would be

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[2] Hamming distance (Hamming, 1950) is a standard tool in information coding and transmission theory, but also widely used in diverse areas of science and engineering as cryptography, pattern recognition, image analysis, and analysis of genomic sequences (He, Petoukhov, & Ricci, 2004).

Table 1: Relative frequencies of SCCS-categories

	Hum	Ani	Arc	Art	Nat	Ele
Entire database	0.39	0.30	0.40	0.25	0.40	0.44
Selected clips	0.50	0.38	0.50	0.44	0.44	0.50

Table 2: Descriptive data of the stimulus material

	Entire database	Selected clips
Minimal duration (seconds)	30.0	31.0
Maximal duration (seconds)	172.0	172.0
Mean duration (seconds)	68.5	69.1
Mean number of categories/clip	2.17	2.75

achieved for all categories by a complete and uniform coverage of $\mathbb{B}^6$. Table 2 contains descriptive data of the video clip database and of the 32 selected video clips.

Apparatus

Ganzfeld stimulation, room A: The same procedure for the multi-modal ganzfeld (MMGF) was used as in our earlier studies (Wackermann, Pütz, Büchi, Strauch & Lehmann, 2002; Pütz et al., 2006): The subjects' eyes were covered with semi-translucent goggles (anatomically shaped halves of ping-pong balls) and illuminated with a red-coloured 60 Watt incandescent lamp, from a distance of $\sim$120 cm. Monotonous sound of a waterfall was played back via headphones.

The room A was equipped with a 'voice-key', which was triggered by the onsets of subjects' imagery reports; the device generated digital signals, which were transmitted to a computer in the adjacent room where they were stored.

Video presentation, room B: A modified version of the 'Automated Digital Ganzfeld' software, developed at the University Gothenburg (Goulding et al., 2004) based on a MS Windows Media-Player plug-in (Version 6.4), was used for the presentation of the stimulus material and recording of the imagery reports. The software transmitted digital signals marking beginning and end of each trial, and beginnings of the repeated target clip presentations, to the computer in the adjacent room, where they were stored in parallel with the report onset markers.

The video clips were presented on a 17″ XGA Acer FP752 TFT display, at native resolution 1024 × 768 and at the standard monitor refresh rate of 60 Hz, thereby applying a frame rate conversion 50 Hz to 60 Hz for clips based on PAL sources. All video clips were encoded in MPEG-2; 29 in PAL format (720 × 576 pixel), two in NTSC format (720 × 480 pixel), and one video clip was of resolution 382 × 280. The mean effective bit rate of the video clips was 4450 kbps. The distance of the participants to the TFT display was ≈ 75 cm, the angle of vision of the presented video clips was 20° horizontal and 17.6° vertical.

Experimental procedures

After the participants were introduced to the laboratory and the two experimenters, they filled in the questionnaires. They were then separated and obtained individual detailed instructions according to their assigned task in the experiment. As a rule, the participant who completed the questionnaires earlier was assigned to the ganzfeld. In the following the two subjects are named A = the subject exposed to the ganzfeld, and B = the subject watching the video clip;[3] during the experimental session they were accompanied by two experimenters, referred to as E_A and E_B, respectively.

Subject A was introduced to the laboratory room A and explained the ganzfeld procedure. (S)he was instructed to report ganzfeld imagery, if it occurred, at the moment it was maximally pronounced or just about to vanish. Subject B was introduced to the laboratory room B and instructed to watch a short video clip presented (without sound) on the display, and to memorise its contents for a latter recall and written report. Each pair served in one experimental session, which comprised three trials; each trial consisted of a ‘communication’ phase, followed by a ‘rating/reporting’ phase.

Communication phase: During this phase participant A was exposed for 20 min to multi-modal ganzfeld (MMGF) in room A, while participant B watched a target video clip in room B. At the onset of the subject A's report, experimenter E_A stopped the acoustical stimulation and the subject gave a free verbal account of the imagery; afterwards, (s)he answered the ganzfeld inquiry (see the questionnaires and inquiries section above). The MMGF stimulation was then continued until the next verbal report, or the end of the ‘communication phase’.

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[3] In the usual jargon, A and B thus refer to the ’receiver’ and ’sender’, respectively. For reasons that will become obvious from the following description of the procedure, we abstain from the traditional nomenclature.

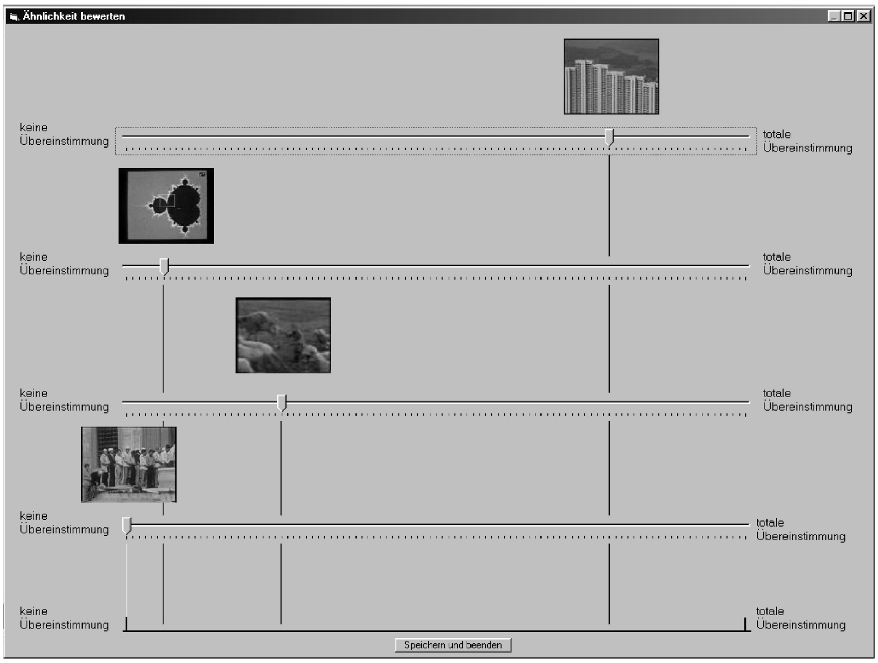

Figure 2. Screenshot of the evaluation software, used for the rating of similarity of the ganzfeld induced experience to video clips.

The subject B's task was to watch a target video clip presented repeatedly in room B, for a total duration of 20 min. Each iteration started immediately after the end of the previous presentation. The subjects were encouraged to follow the presentation as attentively as possible; however, they were also allowed to close their eyes and exert a 'mental replay' of the clip, to avoid fatigue or 'overload'. As soon as the 20 min presentation-loop was over, participant B was guided to room C for the recall of the watched video clip. Afterwards, the ganzfeld stimulation was stopped and subject A guided into room B for the rating.

Rating/Reporting phase: In room B subject A was presented four video clips (the target clip and three 'decoys' from the same 4-set) in random order, and asked to rate the degree of similarity of each of the four clips to his/her prior ganzfeld experience. The ratings were assigned by positioning mouse-operated 'sliders' on a scale ranging from 'no similarity' (0) to 'maximal similarity' (100) (Figure 2).[4] The subject could freely choose the sequence in which (s)he watched the clips and made her/his rating. Simultaneously, subject B (room C) gave a written account of the watched video clip, using a form of her/his choice:

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[4] We should note that the evaluation software used for the ratings does not allow to award the same rating to several video clips, to ascertain unequivocal assignment of ranks.

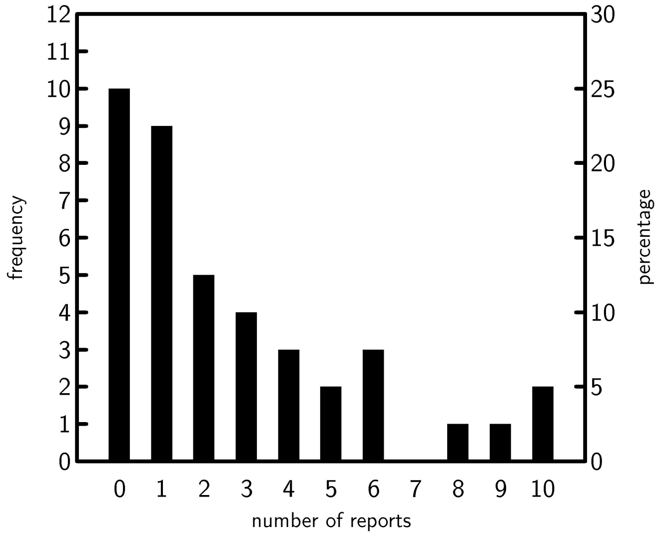

Figure 3. Distribution of report frequencies per session.

written word, drawn pictures, or any combination thereof.

As soon as subject A finished the rating, (s)he was guided back to room A and prepared for the next trial. Experimenter E_A gave a signal to experimenter E_B, who stayed meanwhile in another room, D, via a phone call. Afterwards experimenter E_B told subject B that the time for reporting was over, and accompanied her/him back to room B, where the next trial was initiated.

The 40 experimental sessions were acquired in four blocks of ten sessions each, within a time-span of 13 months. The time periods needed to accomplish one 10-session block varied from 16 to 56 days (mean = 38 days).

Results

A total of 108 imagery reports were collected, that is, in the mean average, 2.7 reports per session. The average yield of the first, second and third trial in a session was 1.0, 0.8 and 0.9, respectively. Figure 3 shows the distribution of imagery report frequency. The U-shaped bimodal distribution suggests large inter-individual differences in responsiveness to the MMGF. Roughly summarised, about 60% of participants gave less-than-average number of reports, in contrast to a small group of 'high responders' ($\geq$ 8 reports/session).

Imagery reports

Relative frequencies of involved sensory modalities were comparable to those reported in earlier studies (Table 3). Ganzfeld imagery was predominately of visual nature, acoustic imagery being the second most frequent sensory modality: relative frequency of other sensory modalities was rather low.

Table 3: Incidence of reported sensory modalities in ganzfeld imagery experiments: SOGF = comparison of sleep onset and ganzfeld imagery (Wackermann et al., 2002), GFS/GFE = screening for 'high-responders' and data from selected 'high-responders' (Pütz et al., 2006), ADGF = data from the reported study. Shown are relative frequencies in percentages. Note that the columns sums >100%, indicating that some of the imagery episodes involved more than one modality.

Modality	SOGF	GFS	GFE	ADGF
Visual	90.4	94.3	97.6	85.2
Acoustic	28.8	16.1	23.2	24.1
Olfactory	16.4	3.2	3.7	0.0
Tactile	26.0	9.7	8.5	9.3
Kinaesthetic	0.0	5.4	2.4	7.5

Similarity ratings

The data collected in the rating phase (see the methods section) consists of 40 (pairs) × 3 (trials) = 120 data vectors. Each of these vectors contains four similarity ratings (0–100 scale) of the four video clips in the given 4-set. For the purpose of further analyses, these ratings were sorted in a descending order and transformed into ranks; that is, rank '1' corresponds to the highest score, and rank '4' to the lowest score.

Of particular interest are cases when the highest rating was assigned to the video clip actually presented to subject B ('target'). If the subject A's task were solely to indicate the clip of the highest degree of similarity (forced choice), these cases would correspond to 'direct hits' in the usual nomenclature of ganzfeld telepathy experiments. Therefore, the cases in which the target clip was given rank '1' (highest rating) are in the following referred to as *Correct Target Identification* (CTI).

Statistics of ranks

By single trials: The null hypothesis H_0 predicts a uniform distribution of the ranks '1–4', with probabilities $.25$. Observed frequencies do not deviate significantly from the theoretical distribution (see Table 4); χ^2 = 4.400; *df* = 3; p = .221. The distribution of the observed values

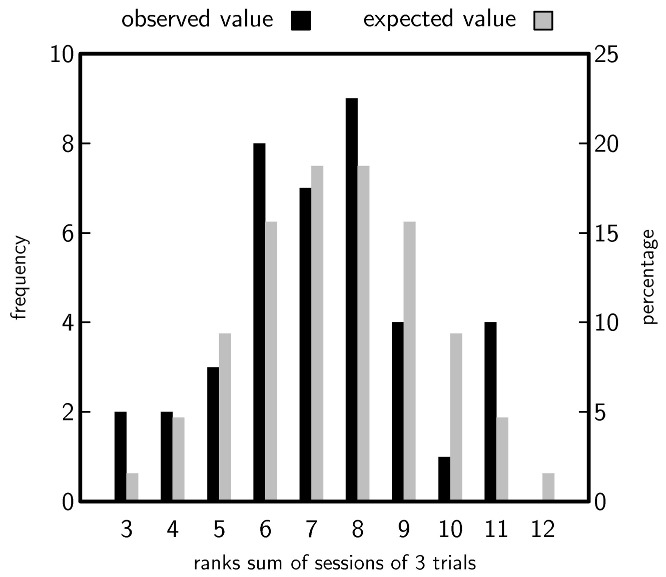

Figure 4. Theoretical and observed distribution of the sum of ranks of the three presented target clips in one session.

suggests that mainly relative frequencies of rank '1' and '2' differ from chance expectancy.

Table 4: Distribution of ranks assigned to target video clips

Rank	Count	Relative frequency
1	39	0.325
2	23	0.192
3	29	0.242
4	29	0.242

By sessions: For each session we take the sum of ranks of the presented target clip, from trials 1–3. The theoretical distribution of these rank sums, predicted by the H_0 ranges from 3–12 (mean = 7.5) and is easily obtained by complete enumeration. The theoretical distribution, and the observed rank sums, are shown in Figure 4. The mean observed rank sums is 7.2, which is not significantly different from the mean chance expectation, 7.5. Noteworthy is a marked asymmetry of the observed distribution, with the obviously deviating values for rank sums 3 and 12.

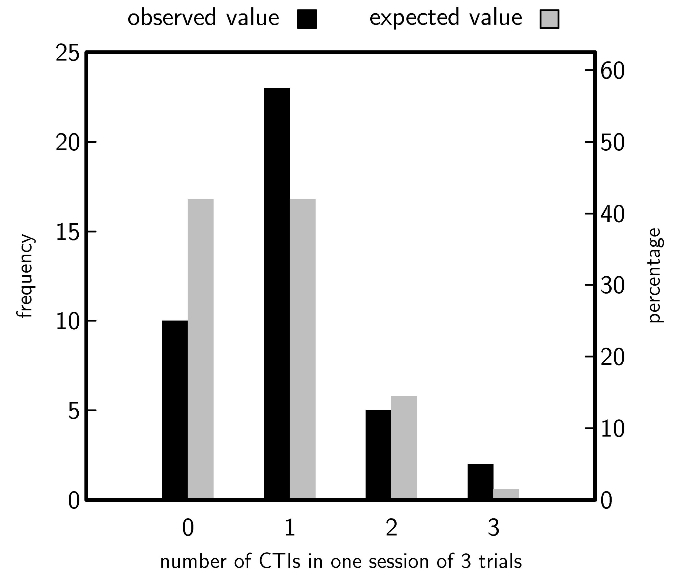

Figure 5. Distribution of correct target identifications per session. Theoretical distribution is shown in gray colour, observed frequencies are shown in black.

Statistics of correct target identifications

By single trials: Here we focus on the total number of correct target identifications. If the subjects were assigning their ratings by chance (H_0), we should expect 30 out of 120 trials (25%) to be correctly identified. The observed number of CTI = 39 corresponds to a 'hit-rate' of 32.5%, which is significantly higher than the mean chance expectation (p = .039, binomial distribution $\mathbf{B}_{120}(.25)$).[5]

By sessions: The above-reported p-value for the deviation of the CTI rate from the MCE implies a Bernoullian model of N = 120 independent trials with a constant probability of success, .25. This, however, is not quite an adequate model for the given experimental design, as the CTIs resulted from three repeated trials for each pair/session. Hence, it is more appropriate to treat the outcome of each session as an independent data unit (similarly as we have studied sums of ranks in the preceding section). The total of CTIs per session can attain values from 0 through 3. If, for the subject A in a given session, the probability of the CTI is .25 (as predicted by H_0), the probabilities of obtaining 0,1,2, or 3 CTIs are determined by the binomial distribution $\mathbf{B}_3(.25)$; this evaluates to

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[5] Here and in the following, $\mathbf{B}_n(p)$ denotes the binomial distribution of successful outcomes from n trials, with success probability p.

$p_0 = p_1 = .4219$, $p_2 = .1406$, $p_3 = .0156$. Figure 5 shows the theoretical distribution (H_0) and the observed distribution of CTI/session.

A comparison of the observed and theoretical distribution, based on the 'classic' Pearson's χ^2 statistics, yields $\chi^2 = .119$, *df* = 3, $p = .044$. However, this result is not trustworthy because of extremely low frequencies in one of the categories (3 CTI/session). Therefore, we should prefer the 2I-test, which is designed for the same purpose but more robust (Weber, 1980, p. 194ff). The 2I-statistics is 7.254, that is, below the critical value for 3 *df* ($p = .064$); hence we consider the result as merely suggesting a better-than-chance performance in target identifications.

Extreme performance

Two subjects correctly identified all three targets in one session ('hat-trick'). As shown above, the probability of a 'hat-trick' response is $p_3 = .0156$; thus the two 'hat-tricks', taken as singular events, suggest at the first sight a 'significant' result. However, the binomial probability $\mathrm{B}_{40}(p_3)$ to get *at least* two 'hat-tricks' in a series of 40 sessions evaluates to $p = .129$, indicating that the occurrence of 'hat-tricks' is not much of a surprise. Incidentally, one of the two pairs producing three CTIs in a session were twins (this pair also participated in another session, not included in statistical evaluation; see the appendix).

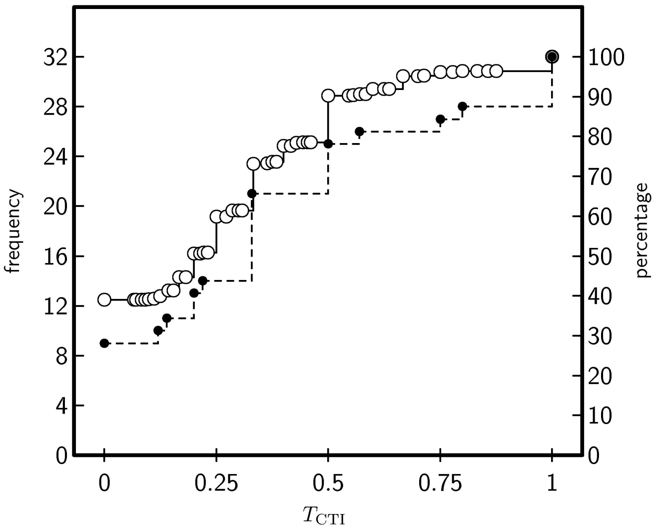

Figure 6. Cumulative frequency distribution of target-specific identification rates (T_{CTI}) observed in our study (dots), plotted against a theoretical distribution (open circles) estimated via a Monte-Carlo simulation (see text).

Table 5: Correlation between NEO-FFI personality factors and CTI/session. Row A: participants exposed to MMGF; row B: participants watching the target clip. Shown are Spearman correlation coefficients, values in bold font are statistically significant ($p < .01$).

NEO-FFI	N	E	O	A	C
A	.125	.166	−.290	.196	**.438**
B	−.230	−.082	−.041	.054	.152

Correlations between CTIs and other variables

Spearman's rank correlation coefficients between numbers of CTI/session individual variables such as ganzfeld productivity (e. g. number of reports per session), personality factors, interpersonal relationship, and physical/mental status of the participants, were calculated for both groups A and B.

Imagery productivity: Correlation between the number of CTI/session and the number of imagery reports per session (group A) was almost exactly zero (r = .036, *df* = 38, p = .825), thus indicating no relationship.

Interpersonal relationship: The only noteworthy correlation between interpersonal relationship intensity (group B) and CTI ($r = -.29$, p = .09) is not statistically significant.

Personality factors: Five personality factors, Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A) and Conscientiousness (C), were assessed by means of the NEO-FFI. Table 5 shows correlations between these personality factors and CTI/session for both groups of participants, A and B. The only significant, and remarkably high, correlation was found for the personality factor Conscientiousness in participants A (r = .44, p = .005).

Status variables: For participants A two variables from the status inquiry before the experiment were significantly or almost significantly correlated with the number of CTI/session: 'alertness' (r = .29, p = .07) and 'emotional condition' (r = .31, p = .05).

Target-specific identification rates

The obviously non-uniform distribution of ratings across the video-clips suggest that some clips were 'favoured' by the participants, that is to say, they were frequently given the highest similarity score whenever the respective 4-set was used. For example, the 4-set shown in Figure 1 was used nine times in the entire study; the 'caterpillar clip' (Figure 1b) was used four times as the 'target', and in all four instances given the highest score, i.e., 'correctly identified'.

The experimental procedure principally allows re-use of stimulus material (similarly to the 'open deck' strategy) and thus such non-uniform re-occurrences of the same set/stimulus are to be expected. This, however, lets the question arise whether the observed non-uniformity of CTIs across clips is caused by an unknown factor — perhaps 'anomalous cognition'? — or are rather due to the fact that some video clips are more 'appealing' to the subjects than others (a sort of 'stacking effect'). It is thus of interest to see if certain stimulus contents are better suited for anomalous information transfer. For this purpose, we examine 'target-specific identifications rates', defined as:

$$T_{\mathrm{CTI}} = N_{\mathrm{CTI}}/N_{\mathrm{shown}}$$

where N_{CTI} is the number of times a target video clip was correctly identified and N_{shown} the number of times the video clip was used as a target.

Figure 6, showing the cumulative frequency distribution of T_{CTI} in our study demonstrates a relative deficit of target clips that were *never*

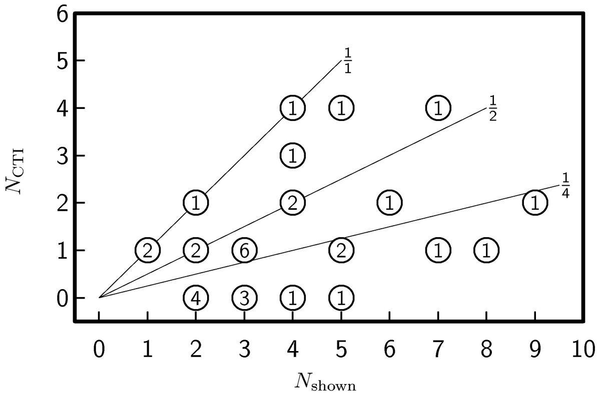

Figure 7. Plot of the numbers of correct identifications (N_{CTI}) versus the numbers of target usage (N_{shown}). Three target-specific identification rates are shown for reference: T_{CTI} = .25 (mean chance expectation), .5, and 1. Figures in circles denote target clip occurrences.

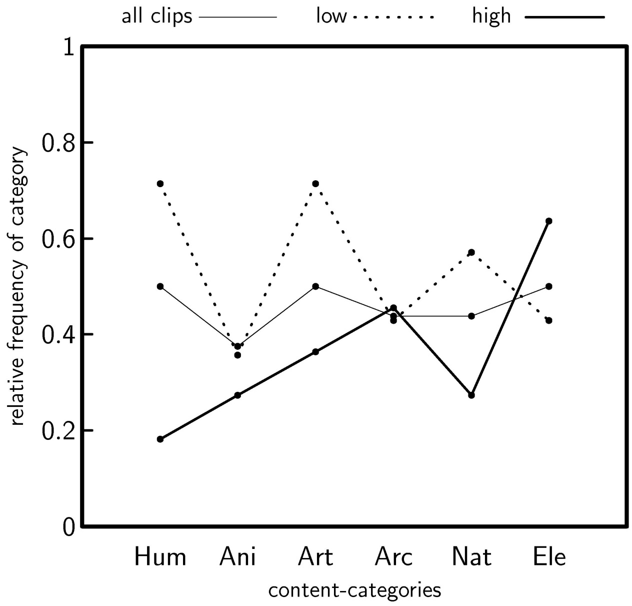

Figure 8. Relative frequencies of content categories shown separately for the two subsets defined by extreme T_{CTI}'s, S_{low} and S_{high}, and the entire pool. Abbreviations: Hum = Humans, Ani = Animals, Art = Artefacts, Nat = Nature, Ele = Elements.

identified ($T_{\mathrm{CTI}} = 0$). By contrast, four out of 32 video clips were *always* correctly identified ($T_{\mathrm{CTI}} = 1$). The content codes of these four clips were: 'animals' and 'elements', 'humans' and 'architecture', 'architecture' and 'elements', and 'animals'. The first two of the four just mentioned clips belonged to the same 4-set. To estimate the probability to get *at least* four target clips with $T_{\mathrm{CTI}} = 1$ in an experiment of given design (120 trials, 32 clips), a Monte-Carlo simulation of 10000 such experiments was carried out, yielding $p = .023$.

A plot of the numbers of correct identifications versus the numbers of target usage (Figure 7) reveals that those four video clips with $T_{\mathrm{CTI}} = 1$ account for eight of the total 39 correct target identifications, that is, 20.5%. Eleven targets have $T_{\mathrm{CTI}} \geq .5$ and account for 64.1% of all CTIs; in other words, almost 2/3 of observed CTIs are based on only 1/3 of the stimulus material.

To examine differences in the content categories for targets with high and low identification rates, two subsets were drawn from the stimulus material, based on a median-split at .333: S_{low} consisting of clips with $T_{\mathrm{CTI}} < .333$ ($n = 14$), and S_{high} consisting of clips with $T_{\mathrm{CTI}} > .333$ ($n = 11$). A visual inspection of the 'content profiles', i. e. of relative frequencies of the six SCCS categories, for the two sets, S_{low} versus S_{high}, reveals that targets with high T_{CTI} were generally 'simpler' in terms of the contents than those with low T_{CTI} (Figure 8). Mean numbers of content categories for subsets S_{low} and S_{high}, were 3.35 and 2.09 respectively. This applies to five of six content categories, with an exception of the category 'elements' which is more frequently present in S_{high} targets (63.3%) than in S_{low} (42.9%).

Discussion and conclusion

The modified experimental procedure yields 'hit-rates' comparable to figures reported from traditional ganzfeld-telepathy experiments, even if the participants had no intent to establish a 'telepathic communication' and, in fact, were not selected for their belief in the possibility of such communication.

Average yield of imagery reports was lower than in our earlier study (Pütz et al., 2006); this, however, was expected, as the subjects were not pre-selected for 'ganzfeld responsiveness' and none of them had former experience with ganzfeld. Given the lack of a correlation between CTI/session and imagery productivity, it is quite possible that the genuine ganzfeld imagery is not directly related to, or necessary for, anomalous cognition.

The observed rate of correct target identifications, 32.5%, is significantly higher than the mean chance expectation. However, statistics based on CTI/session only approached the conventional limit of 'significance', and statistics based on ratings of all four video clips in a respective set did not show a significant deviation from H_0. Therefore it would be premature to interpret the results as indicative of an anomalous information transfer. We still cannot fully rule out the possibility of a 'stacking effect' (see above) or other, unknown sources of the observed effect.

Noteworthy, Goulding et al. (2004) obtained results close to chance level, using basically the same software as in the present study but different stimulus material. In their study, the choice of video clips was based on rather subjective criteria: "the clips chosen were clips that [the experimenters] thought would be interesting and meaningful for the participants." (Goulding et al., 2004, p. 79). By contrast, the selection of the stimulus material for our study was based on pre-defined, content-related criteria (see the section on stimulus material for further details).

This leads to the problem of the choice of suitable stimulus material for ganzfeld-telepathy experiments, or experiments in anomalous cognition in general. Our results seem, on first sight, to be rather in line with the findings of May et al. (1994) and Lantz et al. (1994) who preferred homogeneous stimuli in remote viewing experiments. In our study, the comparison of targets with low and high T_{CTI} suggests that homogeneity and/or 'topical restriction' are related to higher identifications rates. Here the notion of homogeneity applies to *single stimuli*; however, maximal content diversity is arguably required on the level of *stimulus sets*. Therefore, the entire sets should be as 'rich' as possible, in other words, heterogeneous in terms of within-set content differences. For this purpose we used the above-described content-classification and set-construction procedures. This is, to our knowledge, the first ganzfeld-telepathy study where such strictly formalised criteria have been applied.

It is also worth mentioning that stimuli with high T_{CTI}s often included the 'elements', i. e. water, air, earth or fire. We may assume that such stimuli, often of amorphous appearance, may remind of the ganzfeld exposure — indeed, ganzfeld is often described by participants as a 'diffuse red mist or fog'. This would be a trivial explanation for increased similarity ratings (and thus for increased frequency of rank '1' scores), but would not *per se* explain the increased *correct identification rates* (unless these are due to a 'stacking effect'). Or is perhaps the 'elements' category better suited for anomalous information transfer?

Given that many open questions as to the nature of the observed effect, our interpretation of correlations between the CTI performance and personality or other individual factors can be only tentative. Interestingly, it was only the personality factor 'Conscientiousness,' i. e. determination and goal orientation, which was positively correlated with CTI rates per session, while 'Extraversion', a personality trait frequently connected to success in 'psi tasks' (Honorton, Ferrari & Bem, 1992) was not correlated to the CTI performance. Further, we did not find any relation between interpersonal relationship and CTI performance. The correlations with status variables suggest that participants who were more alert and in higher mood at the beginning of the experiment were performing better in terms of CTI. According to these results, participants who were more focused and compliant with the experimental situation were more successful in target identification than those with a less compliant attitude.

Our findings question the alleged importance of the participants' attitudes and beliefs concerning anomalous cognition or 'psi', or even of their being aware of the aim of the experiment. Thus it seems unnecessary to insist on 'belief in psi' as a selection criterion. Using the cover story, the proper aim of the experiment is concealed from the participants; there is no risk that 'skeptical' participants would be facing an 'impossible task'. Consequently, the modified experimental procedure allows to study dyadic communication in ganzfeld with general population, or samples selected by other criteria unrelated to anomalous cognition. An important component of the procedure is selection/construction of the stimulus material, using formalised, objective criteria. Last but not least, the method used to collect reports of ganzfeld-induced subjective experience is compatible with simultaneous electrophysiological recordings.

Finally, we would like to quote from Bem, Broughton & Palmer (2001, p. 215), who argued that "[p]erhaps there is some merit in continuing to conduct exact replications of the ganzfeld procedure, but genuine progress in understanding psi rests on investigators' being willing to risk replication failures by modifying the procedure in any way that seems best suited for exploring new domains or answering new questions." We feel that our study suits well this programmatic thesis.

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Appendix

One of the two pairs producing three CTIs in their experimental session ('hat-trick') were female, 22 years old twins. The sisters showed high similarity in their appearance and habitus and looked like identical twins. However, the assumption has not been tested and we cannot say with certainty if they are mono-zygotic twins. About one year later, they contacted the experimenters and expressed their interest in participating in another ganzfeld experiment. A second experiment was carried out with the pair, using the same procedure and instructions as in the first one. However, we have to assume that the participants were at that time aware of the proper intent of the experiment. The second session was arranged with changed roles ($A \leftrightarrow B$) of the participants. Results of the second session are reported here for the sake of completeness, but they were not included into the data of the present study.

The similarity scores given by subject A in the second experiment yielded two correct target identifications. This result *per se* is not remarkable: the probability to obtain, by chance, at least two CTIs in three trials is p = .156. However, combining the two sessions and evaluating the probability to obtain at least five CTIs in six trials is p = .0046 (as given by binomial distribution $\mathbf{B}_6(.25)$), which is quite impressive.

Also remarkable are the subject A's ratings themselves (Table 6). The scores assigned to the correctly identified target clips were '99' and '100'. It is unlikely that these scores really respond to the experimental task, that is, to evaluate similarity between the ganzfeld-induced experience and the visual material (clip); they may rather reflect the subject's intention to indicate the target clip. In other words, the use of the extreme scores on the similarity scale corresponds to the shift from a 'covert' to the 'overt' experimental task, in which subject A attempted a correct target identification.

Table 6: Rating scores of twins in first and second session.

First session	Target	Decoy 1	Decoy 2	Decoy 3
Trial 1	89	19	28	11
Trial 2	83	15	68	75
Trial 3	82	77	56	29
Second session				
Trial 1	99	75	25	0
Trial 2	100	60	0	10
Trial 3	50	0	90	16

Of course, the single case reported here is merely suggestive of anomalous cognition and not a 'statistical proof'. Nevertheless, the idea that there may be 'special bonds' between twins is wide-spread; this not only as a popular belief but also as a topic of serious studies, pioneered by F. Galton more than a century ago (Galton, 1883, pp. 226–231). Also, these special ways of communication may be not restricted to anomalous cognition. For example, Duane and Behrendt (1965) described 'extrasensory electroencephalographic induction' in two out of fifteen identical twins: occurrence of EEG alpha rhythms in one subject reportedly 'induced' alpha rhythms in EEG of the other subject. In spite of an amount of literature on the topic of 'twin-telepathy' (see Playfair, 1999, for a review), the results are still inconclusive. Recently Parker (2006) reported preliminary results from a ganzfeld study with identical twins:

ten pairs of fifteen tested so far obtained a ‘hit-rate’ of 40% (in regard of the small sample size not significant). The question whether twins really are more likely to establish anomalous communication remains still open.