Project 190/10

THE SHAREFIELD: A NOVEL APPROACH FOR FORCED-CHOICE GESP RESEARCH

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Bial

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SUMMARY

While free-response protocols, such as the Ganzfeld, produce adequate effect-sizes, they are time- and resource-intensive; a single trial, or data point, can take up to one hour. Thus, these approaches are not well-suited for process-oriented psi research, especially in a field of limited resources.

This project focuses on an alternative approach: it combines "noise-reduction" - or optimization - procedures, such as those present in the Ganzfeld, with a forced-choice protocol, that involves a far higher data collection rate. The project has a double objective :

- to develop a flexible tool for process-oriented psi research, that can be adapted to various theoretical and experimental issues;

- to conduct a first study exploring the use of this tool in a dyadic-ESP or telepathy context (named the Sharefield). Salient aspects of the Sharefield protocol include:

- *Multiple trials*: A 45 minute session consists of 20 ESP trials; each experimental trial, including receiving, judging, and feedback, is completed in two minutes.

Symmetric participant roles. Participants alternate sender/receiver roles on a trial-by-trial basis; at the beginning of each trial, the software announces to each participant their role, and accordingly launches sender or receiver tasks.

- *An Optimization Experience (OE) in an immersive environment:* Both participants wear an audiovisual head-mounted display (HMD) which immerses them first in an audiovisual relaxation procedure, followed by a slowly animated starfield and meditative soundtrack that remain present throught the session.

- *A training process and baseline condition.* Prior to the OE session, participants go through a short training session that familiarizes them with the general protocol, minus the optimization procedures. This Non Optimized Experience (NOE) session permits the collection of ESP "baseline" data, to be compared to results under the optimization conditions.

Three formal hypotheses were formulated for this experiment:

I) the trial effect size for the OE condition would be statistically significant;

II) the trial effect size for the OE condition would be significantly superior to the NOE effect size;

III) the OE session effect size would be significantly superior to that established for the Ganzfeld.

Twenty-five participant-pairs (50 participants) were run in the laboratory of the Institut Métapsychique International (IMI). All participants first completed online versions of two questionnaires. Then, upon arrival at the IMI, and following introductory procedures, participants were first run through the NOE condition and then the OE condition. Finally, a half hour debrief period allowed us to collect qualitative participant impressions concerning their experience of the Sharefield.

None of the three hypotheses were confirmed to a significant degree, though a near-significant trend was shown for Hypothesis II (higher results in the OE vs. NOE condition). Secondary analyses did produce some suggestive evidence that, in the OE condition specifically, the null results may have been due to high variability in scoring (i.e., psi hitting and psi missing), rather than a simple absence of psi.

Post-session debriefings with participants allowed us to establish potential problems with the protocol, at least from an experiential perspective. In particular, over half the subjects reported considerable physical discomfort with the HMD system, and found the trial-by-trial hit/miss feedback distracting.

On the positive side we are quite encouraged in terms of the potential of our approach for integrating optimization procedures and multiple-trial psi tasks within an automated protocol. Despite the discomfort of the HMD system, the great majority of participants expressed interest in returning for more sessions. Participants' reports during debriefings suggest that the relatively sustained rhythm of 20 trials / session did not perturb their experience of the OE. Indeed, many felt that they were beginning to learn successful strategies for correctly guessing the right target, over the course of the session; they felt that they could benefit from more time to test these strategies. At the same time, nearly all participants under-estimated the duration of their sessions - a sign that they found the experience engaging rather than tedious.

Thus, while pointing to the need for specific improvements, the quantitative and qualitative data of this first experiment also suggest that the general approach is sound,. We hope to take two directions in the near future: one, introduce several changes for the dyadic ESP protocol (i.e., the Sharefield), in order to amplify the psi-conducive state; second, develop single-subject versions of the software, geared toward clairvoyance or precognition, that can be implemented more readily and are less demanding, in terms of resources.

INTRODUCTION

The Ganzfeld paradigm remains among the most reliable research protocols in parapsychology. In over four decades of experimentation, numerous laboratories have contributed to a large database of replications, and the overall conclusions of meta-analyses show that the evidence for anomalous communication, or psi, is highly significant. The Ganzfeld has also inspired numerous extensions and variations, which render the literature of free-response studies quite heterogeneous. Over a decade ago, Bem, Palmer & Broughton (2001) emphasized that while the Ganzfeld literature includes a core of replication studies that adhere closely to the canonical Ganzfeld protocol (as exemplified by Honorton et al., 1990), it also incorporates a variety of extensions to the protocol which explore a range of alternative implementations of targets, tasks, trial durations and participant preparation.

While the standard replications produce fairly consistent evidence for psi, non-standard studies, both in their occasional successes and in their failures, help to indicate productive directions for future research. As Bem et al., have remarked: "Perhaps 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." (p. 215)

Two recent meta-analyses underscore the importance of exploring alternative protocols. In a broad meta-analysis of free-response experiments (Storm, et al., 2010), the authors argue that in addition to the canonical Ganzfeld, significant effects are also found in experiments which employ alternative forms of psi-conducive state induction procedures, such as hypnosis, relaxation and meditation. In a subsequent review of forced-choice experiments, the same authors suggest that despite effect sizes that are an order-of-magnitude smaller, forced-choice protocols remain experimentally viable due to their relatively high data collection rates (Storm, et al., 2012).

Free-response protocols are time and resource intensive, especially when coupled with optimization procedures; a single Ganzfeld trial can take 1 to 2 hours to complete. By contrast, forced-choice protocols, even when incorporating optimization procedures, can produce up to several trials per minute and thus have data rates of one to two orders-of-magnitude higher than free-response studies. Based on the narrow criterion of expected study significance, it is unclear that free-response approaches hold an advantage over forced-choice protocols, particularly when both may benefit from participant optimization procedures.

The trade-off of data rate versus effect size in forced-choice and free-response paradigms offers a useful perspective for the development of improved protocols. Clearly, much effort has already been invested in enhancing effect sizes in free-response tasks (e.g., through state-induction procedures) and in forced-choice tasks (e.g., by testing under hypnosis, using game-like tasks or real-life settings, as in Sheldrake's telephone telepathy experiments). Ultimately, the goal of developmental research along these lines is to produce protocols with higher and more robust *study* effect sizes, which can then be adapted to process-oriented research addressing fundamental questions of psi functioning.

PROJECT RATIONALE AND OBJECTIVES

The present project was motivated by two objectives:

- to develop a psi research tool that associates high data-collection rates with subject-optimization procedures, and that can be adapted to a range of experimental and theoretical issues
- to conduct a controlled experiment based on this research tool, so as to assess its usefulness within a dyadic ESP (or telepathy) context.

For purposes of presentation, we will first briefly focus on the development facets of the project, and then discuss the experiment itself in more detail.

I. Development of a process-oriented research tool

Our efforts to develop a tool that could be useful for a wide range of issues in psi research were based on three guidelines.

1. *Associate optimization procedures with higher data collection rates, to mitigate the usual trade-off between forced-choice vs. free-response paradigms.* This meant creating a fluid, psi conducive experience for participants, one which can be sustained throughout a session involving repeated execution of an ESP task.

2. *Develop a software tool that can generate laboratory-ready protocols, and readily be adapted to different research questions.* We thus aimed to integrate all aspects of the protocol into a single modular program, whose structure and parameters are readily amenable to changes and enhancements, in accordance to the research questions of the investigator.

3. *Ensure that protocols are largely automated, so as to enhance methodological study quality and minimize dependence of results on experimenters' interpersonal skills.* The essential idea here was to maximize the likelihood of inter-laboratory replicability by reducing variability in results which would be due to different experimenters' skills.

In seeking to create a research tool in accordance with these guidelines, we had to work on a number of challenges throughout the development phase of the project.

A major issue that needed to be resolved in the early phases of the development process was finding a software platform that would adequately manage both the administrative facets of the experiment (protocol design, administrative setup, local network data exchanges, etc.) and the rather intensive audiovisual elements required by our approach (ESP targets superimposed on high resolution graphical animations, synchronized audio inputs, graphical transitions between different experimental phases, etc.). Closely related to this challenge was the need to find programmers who would be competent in terms of both administrative and audiovisual tasks, and who would remain responsive to our needs throughout the early, trial-and-error phases of development.

Following a period of evaluation of different software platforms and potential programmers we realized we would have to rethink our approach for software development. Given the complexity and evolving nature of our programming demands, the budgetary constraints, and the need for a flexible, trial-and-error approach, it seemed clear that we needed to develop all software in-house, rather than with an external programer. We thus attributed full responsibility for program development to Peter Bancel, thus extending his tasks to software development (he was only supposed to supervise the external programmers). This, of course, was added to his other tasks (experimental design, experimentation and analyses).

A separate issue concerned the nature of the targets to be used for the psi tasks. While our approach was inspired by forced-choice methods, our intent to integrate subject-optimization procedures meant including more real-life, emotionally involving targets, rather than the artificial target sets of forced choice tasks (e.g., ESP-card symbols). In the end, as will be seen in the Method section below, we created a hybrid approach, one which strikes a balance between the simplicity of forced-choice ESP targets, and the attractiveness of free-response targets.

Considerable thought and effort also went into the design of audiovisual optimization procedures - the spoken and written texts, the background and target-related sounds, and the animated or still graphics that preceded or accompanied each trial. These had to not only help induce a psi-conducive state of consciousness in participants, but also help maintain this state throughout the session despite the repetitive nature of the ESP task and the multiple trials. As will be seen below our solution was to create a continuously animated audiovisual background (a hypnotic starfield coupled with meditative sounds) and have the individual ESP trials (instructions, targets, etc.) smoothly emerge out of, and fade back into this constant background.

A final challenge for the development aspect of the project concerned the use of an immersive environment through which participants were to experience the optimization procedures and the ESP tasks. Contrary to our initial expectations, we discovered that reasonably priced Head Mounted Displays systems (HMD) did not have the graphical resolution and responsiveness we needed to create a realistic immersive experience for participants. This forced us to reconsider our strategy and develop an alternative approach, involving two screens placed at an angle at each other and allowing for an optical "mixing" of the graphical background and the target images. In December 2011, however, Sony announced the release of a general public HMD system with excellent audio and video specifications, leading us to return to the original plan. After testing these out, we indeed determined that they were well suited for our project, in terms of the sound and video quality, and began to center development of the software around these units.

II. A telepathy experiment : The Sharefield

Although the research tool we developed, incorporating optimization procedures within a multitrial ESP task, could be used to investigate a range of psi phenomena, for our first experiment we decided to introduce a telepathy protocol, involving two participants: one acting as agent or *sender* (who attempts to convey a randomly selected visual target) and the other as percipient or *receiver* (who attempts to capture significant elements from the target and then identify it from amongst decoys). The most well-known approach associating a telepathy protocol to optimization procedures is the Ganzfeld; to highlight the specificity of our approach it is helpful to contrast the Sharefield protocol with the canonical Ganzfeld.

No mentation. A Ganzfeld session typically generates a single trial following an extended mentation period while the participant experiences an OE of a monochrome visual field and white or pink noise. While some attempts to increase the number of trials per Ganzfeld session have been made (Parker, 2000), the mentation period renders gains in data collection difficult. The Sharefield eliminates mentation during the OE. The sending/receiving period is reduced to 10 to 20 seconds, and a full experimental trial, which includes judging and an inter-trial transition, is completed in about two minutes.

Multiple trials. The reduced trial time allows for multiple trials during an experimental session. The Sharefield protocol incorporates 20 trials into a 45 minute session.

A continuous OE. In the Ganzfeld, participants are removed from the OE at the time of target judgment. In the Sharefield, the OE is delivered via an audiovisual head-mounted display (HMD) which presents an animated, drifting starfield and a meditative musical track to the participants. This audiovisual background is constantly present, during both sending/receiving and judging phases of the trial. Targets, tasks and between-trial instructions are seamlessly integrated into this audiovisual background, thus achieving a continuity of flow throughout the session.

Symmetric participant roles and shared OE. In the Ganzfeld protocol, participants have a fixed role throughout the session, as either sender or receiver and their respective environments and tasks are quite different. In the Sharefield, participants alternate sender/receiver roles on a trial-by-trial basis. Furthermore, they are both immersed in identical optimization environments, delivered by the HMD hardware system. The use of the HMD technology is reminiscent of earlier studies that explored telepathy in a virtual reality environment (Murray, Howard, Wilde, Fox, & Simmonds-Moore, 2007). Here, however, we use the HMD system simply to create an immersive experience.

Two further considerations complete the conception of the Sharefield protocol:

Simplified judging task and target sets. The elimination of mentation periods in the Sharefield is coupled with the use of a simplified cognitive task, involving a choice between two possible images. For each trial the image set consists of a grey, neutral image which is constant over all trials and another which is visually complex, emotionally stimulating and randomly selected without replacement from an image pool ((Figure 2). The receiver is asked to sense whether the target is complex and stimulating or relatively simple and neutral. Thus in the Sharefield, the judging task consists of choosing between a familiar neutral image and a content-rich unfamiliar one, whereas in the Ganzfeld it involves selecting among four content-rich images. An alternative way to describe the psi task is to say that the receiver is asked to sense whether the sender is strongly stimulated by the target or not. In this context, the Sharefield is analogous to a study by (Ferris & Rock, 2009), using a DMILS-type task in a Ganzfeld environment in which the receiver must decide whether the sender is in "influence" vs. "no-influence" mode. It also has parallels with multiple-trial forced-choice studies involving hypnosis and no mentation (Tressoldi & del Prete, 2005; del Prete & Tressoldi, 2007).

A control condition and a training process. The instructional set for receivers in a typical Ganzfeld experiment is fairly straightforward. In the mentation phase the receiver is asked to "think out loud" while the sender focuses on a target. In the judgment phase, which is generally guided by the experimenter, the receiver chooses one of the 4 targets displayed on a computer screen with a mouse click. In the Sharefield, participants are confronted with a considerably more complex situation, involving multiple trials, multiple phases within trials (sending/receiving, judging, feedback), inter-trial relaxation phases and alternating sender/receiver roles - all this, while potentially in an altered state of consciousness and without any guidance from the experimenter.

We decided that the complexity of this situation necessitates a participant training process *prior* to the Sharefield session, so that they can be fully familiar with the different phases and tasks of the experiment.

At the same time, we were interested in collecting baseline trials from our participants, so as to determine whether or not any eventual psi effects could be attributed specifically to the optimization procedures, rather than participants' existing skills in forced-choice psi tasks.

These two objectives - training for the Sharefield session and collecting baseline psi data- were combined through a within-subjects design introducing a *Non-Optimized Experience* condition (NOE) prior to the *Optimized Experience* condition (OE). Unlike the OE, the NOE did not involve use of the HMD, nor any relaxation procedures or immersive graphics and sounds; it did, however, involve the same tasks, target sets and trial structure as the OE condition. Thus, the NOE consisted of a short (10 minutes, 12 trials) session that all participants went through before the longer OE session (20 trials, 45 minutes).

We are quite aware that a balanced design (e.g., with NOE sessions coming before or after OE sessions) would have been preferable from an analytical perspective; however, for us it was a priority to allow participants to learn the intricacies of the multi-trial protocol before beginning the OE session.

It should be noted that the Ganzfeld literature does include a few analogous within-subject comparisons of Ganzfeld vs. no-Ganzfeld conditions (e.g., da Silva, Pilato & Hiraoka, 2004; Ferris & Rock, 2009); such comparisons are more frequent in the hypnosis-psi literature (see Stanford & Steiner, 1994; Del Prete & Tressoldi, 2005; Tressoldi, & Del Prete, 2007).

Hypotheses

Given the novelty of the approach, we considered this first study as exploratory - it was principally intended to help us evaluate some of the key elements of the protocol choices (targets, session length, feedback parameters, optimization procedures, etc.) so that we can subsequently enhance its long-term usefulness as a research tool. Nevertheless, we did formulate three formal hypotheses:

I. The trial effect size in the OE condition will be significantly greater than chance.
II. The OE trial effect size will be significantly greater than the NOE condition.
III. The session effect size for the OE condition will be superior than that obtained in the standard Ganzfeld protocol. This hypothesis addresses the goal of developing protocols with higher study effect sizes for process-oriented research. We use a value for the standard Ganzfeld effect size of ES = 0.135 which is the mean effect size of a homogeneous datase of 102 Ganzfeld studies described in Storm, et al. (2010).

Method

Participant selection

Traditional subject selection methods in parapsychology range from elitist strategies, which entail intensive work with gifted subjects, to universalist approaches in which almost no selection criteria are used (as in classroom group tests).

The use of gifted subjects is inappropriate for our study since people with successful experience in performing psi tasks are likely to have personal optimization strategies which could conflict with our imposed optimization procedures and confound our test of hypothesis 2. Thus our first strategy for participant selection leaned more toward the universalist approach - i.e., recruiting participants through word of mouth or announcements on the Institute's website and in its Newsletter. This meant accepting practically anyone willing to participate. However, following some initial pilot tests in the second quarter of 2012, it appeared to us that the immersive nature of the Sharefield environment, coupled with its audiovisual elements, rendered this a rather intense psychological experience for participants. Additionally, the pilot sessions indicated that the Sharefield may create a heightened sense of intimacy between the two participants, one which could become uncomfortable for them if they do not know each other sufficiently. Based on these pilots, the Institute's ethical committee alerted us to the unlikely - but conceivable - possibility that a participant could be psychologically disturbed by the experience, and bring legal action against the Institute (despite the use of release forms). We thus decided to minimize the likelihood of such scenarios, by revising our initial subject recruitment strategy and introducing more stringent criteria for a participant selection :

- Participants had to be selected from amongst the experimenters' personal acquaintances, and have shown some interest in, or openness to, the topic of psi phenomena.
- Participants should fill out a questionnaire prior to any experimental session and report to be in good mental and physical health.
- The subjects of each participant pair must have an established mutual relationship such as friendship, a work-related relationship or family ties.

Using these criteria, we identified 25 subject pairs (50 subjects) that would participate in 25 formal experimental sessions. Because of the loss of data in two cases, we ended up running 26 subject pairs, thus obtaining the planned number of trials for each of the conditions.

Equipment and experimental layout

The Sharefield was conducted at the Institut Métapsychique International (Paris). For each session, the introductory phases of the session were done at the Institute's upper level, while the experiment itself was conducted at the lower level. Participants were situated in two rooms, separated by their respective doors, a hallway, and sound-attenuating curtains on each door (Figure 1). The experimental rooms were prepared so as to be as similar as possible, both visually and in terms of their furnishings: each contained a chair, small desk and a reclining relaxation chair. Each room was also equipped with a MacMini (Macintosh) computer, PC screen and mouse situated on the desk; a Sony HMZ-T1, a general-public head-mounted display (HMD) system with headphones, which creates an immersive experience reminiscent of that being in a small movie theatre; and a video-splitter (permitting simultaneous viewing of the computer output on both the HMD and the PC screen). Finally, a button situated next to the reclining chair, which activated an audio signal in the experimenter's room, permitted the participants to abort the session should the need arise.

The experimenter's post was situated down a short hallway from the participant rooms. The experimenter's post includes a screen and MacMini computer. All three computers are linked via a Local Area Network.

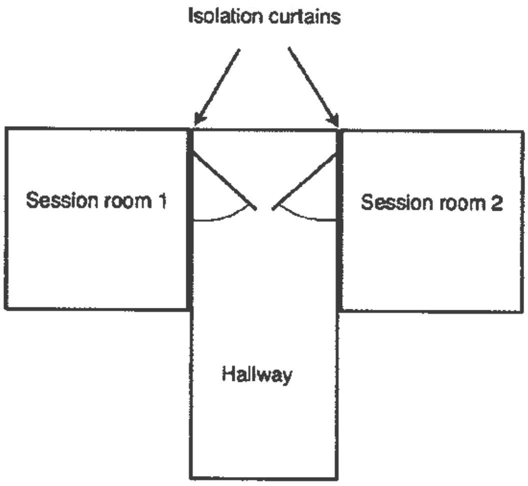

Figure 1. Disposition of experimental session rooms on the lower level of the Institute.

Questionnaires

Participants were asked to provide personal data and respond to two questionnaires:

1. the Big Five Inventory (John, Naumann & Soto, 2008), a self-report inventory intended to measure five dimensions of personality: Extraversion; Agreeableness; Conscientiousness; Neuroticism and Openness to Experience

2. an expanded version of the Psychophysical Research Laboratories' Personal Inventory Form (PIF) which queries participants' attitudes and experiences related to psi phenomena, their experience with mental disciplines, and their familiarity with dreams and absorptive states.

Participants completed the two questionnaires on a dedicated website before arriving at the IMI for the experimental session. The website was password protected and accessible only to participants who have pre-registered with a member of the experimental team and received a unique account login and password.

Instructional materials

Two PowerPoint presentations were developed, to explain the procedures of the NOE and OE sessions to the participants. The NOE presentation illustrates the main aspects and phases of the protocol: the nature of the targets, the screen texts announcing different phases of the session, the receiver's use of the mouse during the judging phase, and the alternation of sender-receiver roles. The OE PowerPoint additionally presents the HMD system and the optimization procedures.

Targets

As mentioned above, two quite different types of targets are used: a relatively neutral, contentless gray form resembling a cloud which is the same throughout all trials (Figure 2) and an image drawn from a set of 32 photographs which were selected from the investigators' personal collections, the International Affective Picture System, and a promotional Remote Viewing website. The selected targets were considered emotionally or visually arousing by at least 3 of 4 judges who worked on the target pool. We favored covering a range of emotional content in the target pool; however, images considered to be too violent, provocative or offensive were excluded, as they were deemed too disruptive for the OE trials.

In the OE trials, targets were presented through smooth transitions, and seamlessly integrated into the ongoing background animated starfield (see OE Procedure). Displayed photographs were accompanied by a 25 second soundtrack (acoustic or electronic music, voices, or nature sounds), that was inspired by the image's contents and intended to amplify the target's impact on participants. The gray form was rendered with a slow undulating animation (rather than being static), and accompanied by a harmonically modified extract of the background music.

In the NOE session the two types of images (the gray form and the photographs) were presented without animation, graphical transitions or sounds.

Figure 2. Typical target set, with the gray form and a content-rich photograph from the target pool.

Software

The experiment is entirely automated and is run by custom software developed in house at the IMI on the Quartz Composer (QC) development platform. Quartz Composer is a free, visual programming language which is part of the Xcode development environment for the Mac OS X operating system. QC applications are used primarily for processing and rendering graphical data in real-time (such as animated screen savers or music visualizers). However, the platform's device I/O, network, system-call and JavaScript capabilities make it a suitable platform for simple interactive, multi-user graphics applications. In the context of the Sharefield project, these capabilities allow for fully integrating all aspects of data-handling, experimental flow and control, and the optimization environment generation into a single application.

The application consists of a suite of three separate programs which are installed on computers at the experimenter's station and in the two rooms housing the participant stations. The administrative station is used to launch and monitor experimental sessions at a distance and write and store data files. It communicates with the participant stations over the IMI Local Area Network either using an Ethernet or a wireless connection. The latter allows a useful mobility for the experimenter during the participants' training, as the experimenter station can be installed on a portable laptop computer or an iPad, permitting the experimenter to launch sessions from either within the participant rooms (during trainings) or at a distant post (for formal sessions).

The participant station applications are mirror programs which communicate between each other and with the experimenter's post. After the session is launched simultancously on both posts by the experimenter, control is passed to the participant stations. These operate in an alternating master-slave relationship which follows the alternation of sender / receiver roles and keeps the two mirror stations synchronized. Once launched, the experiment is entirely automated and no intervention on the part of the experimenter is required. The experimenter is kept blind to target selections, but can track all phases of the session to ensure that the system is performing correctly.

At the start of each trial, control is passed to the participant station operating in the receiver role. The receiver station controls the trial initialization and timing, the target judgment (via a mouse click by the participant), the feedback display mode and session termination. Control parameters are updated and communicated to the sender's station as needed to maintain the synchronization between the posts. The updates control role identification, trial number, initiation, target selection, feedback display and session termination.

Procedure

Preparatory procedures

Investigators contacted the individuals that have been listed as potential participants. If these individuals expressed interest in participating, they were directed to an online Doodle agenda to reserve a session date. An email confirmation is then sent by the IMI secretary, as well as a link and password for the Questionnaires website. The participants had to fill out the questionnaires prior to the session.

Upon arrival at the IMI, participants are given a brief tour of the premises and a preliminary presentation of the experiment. They are then shown the first PowerPoint presentation, describing the NOE trials and explaining the participants' tasks. At this time the experimenter also responds to participants' questions about the sessions and comments on the presentation. It is emphasized that the NOE session should be seen as an opportunity for participants to better understand the user interface, the alternating tasks (as sender or receiver), and other aspects of the protocol.

The participants are then asked to sign the consent form and deposit their cell phones and watches with the experimenter, until the conclusion of the session.

As part of these preparatory training procedures, the two participants are taken through a face-to-face ESP game involving a pack of shuffled cards with drawings. Each participant is dealt 6 cards, face down, which are either blanks or emotionally impactful images, such as those used in psychotherapeutic contexts. The cards were prepared with equal numbers of blanks and emotionally strong images (a baby suckling on a woman's breast, someone stabbing a person in the back, a menacing feline waiting for its victim, etc). The game begins with one participant, the sender, pulling a card and staring at it, while the receiver decides whether the sender has seen an image or a blank. The receiver is then shown the card, and a new trial begins with reversed roles.

In debriefing this game, the experimenters emphasize its parallels to the basic structure of the NOE session: alternating sender/receiver roles, targets that are fairly neutral vs. stimulating, with an equal chance of one or the other appearing; trial by trial feedback; and above all, the nurturing of a connection between the two participants, so that the receiver can sense whether the sender is having a neutral or emotional experience.

The NOE session.

The participants are then led to their respective rooms where they are seated in front of the computer screen. Each participant is accompanied by an experimenter. The NOE training program is launched, and the participants complete 4 mock trials to ensure they fully understand the different phases of the session, and the corresponding participant tasks (e.g., the use of the mouse to register the receiver's target choice and the alternation of sender/receiver roles). Following this, both experimenters exit the participant rooms, shut the doors, and pull the sound isolating curtains.

Figure 3. Two participants in the NOE session, each situated in a separate room

The NOE module is launched from the experimenter's post outside and unfolds as follows:

a. The sending/receiving period begins with instructions that appear on the sender's and receiver's screens ("you are the sender"; "you are the receiver)". A randomly selected target (either the gray form or one of 32 possible photos) is then displayed on the sender's screen, while the receiver's screen states "feel what your partner is seeing".

b. After 5 seconds the judging period begins, with instructions on the receiver's screen stating "please choose". The program then sequentially displays the 2 potential targets (the gray form or a photograph), and the receiver must choose between these two by tapping on the mouse at the time the image is displayed. The program continues to alternate between the 2 possibilities until a choice is made, or until each of the images has been shown 4 times (a slowly shrinking blue sphere, which indicates how much time remains for judging, is displayed at the bottom of the screen). If no choice is made over the course of these 4 cycles, the judging period terminates and the trial counts as a pass (neither hit nor miss). During this whole time, the sender continues to see the target image.

c. Immediately following the receiver's choice, the feedback period begins. For the receiver, the program displays the actual target next to the one that had been selected. Identical images signify a hit, while different ones signify a miss. The sender sees the image selected by the receiver.

d. A new trial then begins with the program inverting the roles of each participant, and displaying the corresponding instructions ("you are the sender"; "you are the receiver)" on their respective screens.

e. This sending/receiving, judging, feedback sequence continues until 12 trials have been completed, each participant having contributed 6 trials as receiver and 6 trials as sender.

f. The program then writes all data to a file, including the codes of the 12 photos used during the NOE session, and provides both participants on-screen feedback on the total number of hits obtained during the session. The two experimenters then come in and accompany their two participants upstairs for debriefing.

The OE session.

Following a short discussion about the NOE session, participants are shown the second PowerPoint presentation, which explains the OE procedure. As before, the experimenters add explanations as needed and respond to questions. They then lead participants downstairs to their respective experimental rooms. Each participant is seated on a reclining chair and fitted with the Sony head-mounted display. The OE training program is launched, taking participants through a very brief relaxation and four mock trials. As in the NOE training module, the experimenters remain next to the participants at this point, to ensure that they are comfortable and understand the different phases of each trial and the user interface. After the training program ends, the two experimenters turn off the monitors and all lights, exit the participant rooms, shut the doors, and draw the isolation curtains.

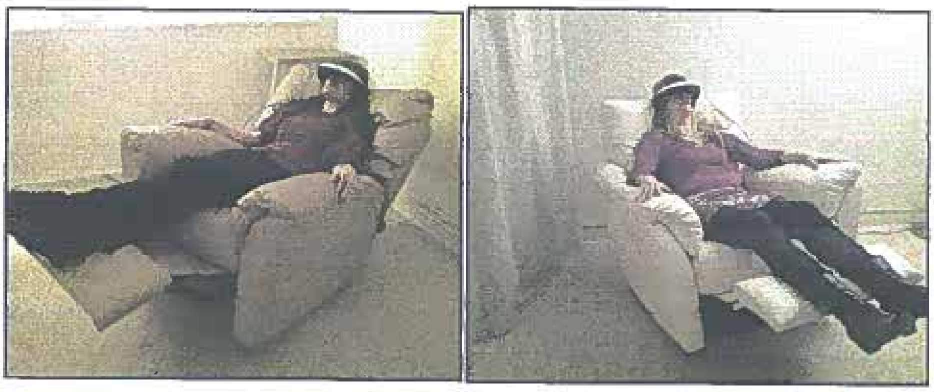

Figure 4. Two participants in the OE session, each situated in a separate room

The OE program is launched from the experimenter's post, as before; the session unfolds as follows:

a. Both participants are taken through a 9-minute induction with suggestions for relaxation, mental focus, and connectedness between the two participants. This is based on a pre-recorded feminine voice and a fairly constant meditative sound called the Heartdrone, as well as a visual of slowly evolving colors, reminiscent of a sunset. As the relaxation progresses, the colors seen through the HMD screen gradually fade out and are replaced by an animated starfield that is moving towards the viewer. This audiovisual environment (starfield plus Heartdrone sound) remains present throughout the OE session.

b. The beginning of the 1st trial is announced with the sound of a gong and texts specifying each participant's role ("you are the sender", "you are the receiver"). As in the NOE session, the sender is then presented with a randomly selected target. Here, however, when the target is the gray form, it is no longer static, but animated with a slowly undulating movement (a rather hypnotic effect); its movements are accompanied by a harmonically enhanced Heartdrone audio. Similarly, when the target is a photo (randomly selected out of a possible 20 photos, i.e., the full photo set minus the 12 photos used in the NOE session), it is accompanied by sounds corresponding to the target content.

c. The receiver is given 15 seconds to sense what his/her partner is seeing. A message then appears, directing her or him to select the image which she or he thinks is being experienced by the sender. The 2 potential targets are displayed sequentially on the screen, along with their soundtracks and the receiver input his/her choice by clicking on the mouse at the moment the desired target is displayed. As in the NOE session, each target is shown 4 times, allowing the receiver ample time to make a choice. The shrinking blue sphere, indicating the remaining judgment time, is also present on the screen.

d. As soon as the receiver makes his or her choice, feedback is provided, as in the NOE session, with the true target appearing on the screen, next to the selected image.

e. A 30 second audiovisual sequence follows that may be thought of as a rest period. It consists of spacious music and slowly moving celestial-like objects (such as pulsating spheres) superimposed on the animated starfield. Additionally, following the 4th, 8th and 12th and 16th trials, spoken texts with suggestions for mental presence and interconnectedness are added to the Heartdrone audio.

		T1	T2	T3	T4	T5	T6	T7
Participant 1:	Relaxation	R	S	R	S	R	S	R
Participant 2:	Relaxation	S	R	S	R	S	R	S

	Detail of trial T3			
Receiver:	Receive	Judge	Fbk	Rest
Sender:	Send		Fbk	Rest

Table 1. Depiction of seven trials of an OE session, showing the per trial alternation of sender (S) / receiver (R) roles, and the phases of a given trial (T3) for each role.

f. The following trial then begins with the sound of a gong and the screen text announcing the reversed sender/receiver roles.

g. The sending/receiving, judging, feedback and rest phases of each trial are repeated until 20 trials have been completed (whereby each participant has contributed 10 trials as sender and 10 as receiver).

h. Feedback on the total number of hits for the team is given, data is stored on disk and, as the starfield and music fade out, the participants are given brief instructions to return to their "normal" state of consciousness. The experimenters enter the rooms, remove the HMDs, and lead the participants upstairs. They then spend between 15 and 30 minutes debriefing the session with a semi-structured interview.

	NOE session	OE session
Powerpoint presentation	Yes	Yes
4 mock trials for training	Yes	Yes
Visual input	PC Monitor	HMD
Sound Input	None	Headphones
Relaxation	None	Yes
Starfield / Heartdrone	None	Yes
Target soundtrack	None	Yes
Neutral Target	Static	Animated
Inter-trial rest periods	None	Yes
Number of trials	12	20

Table 2. A comparison of the Non-OE and OE sessions, showing the main audiovisual enhancements of the OE session. Both protocols use powerpoint presentations and mock trials to introduce the experimental session to participants.

RESULTS

The planned hypothesis tests were evaluated by comparing the experimental results with the MCE of the exact theoretical binomial statistics. Target randomization (whether the target was the gray form or a photograph) and the random selection of photographs (without replacement), which were made by calls to Javascript's pseudo-random number generator, was validated by comparing mean values, variances and run frequencies of the random variables to theoretical expectation in test runs which cycled through several hundred full experimental sessions, and in 10,000 repeated calls from the random number generator using a separate test program.

In addition to the hypothesis tests, a few secondary tests of the data were performed. These include a test for selection bias for the photographs versus the gray form, and tests of anomalous structure in the hit rates. Analyses which cross the experimental data with the results of participant questionnaires will be presented in a later publication.

Main Analyses

Hypothesis I. In the OE condition, receivers made the target selection before time-out in all 500 trials. The total number of hits was 253 (Z = 0.268, ES(trials) = 0.012, ES(sessions) = 0.054. The trial effect size in the OE condition conformed to null expectation. Hypothesis I was not confirmed.

Hypothesis II. In 25 experimental sessions, 300 trials were collected in the NOE condition. Of these, on two occasions receivers failed to register a target selection before the trials timed-out. Targets were correctly identified in 136 of the 298 remaining valid trials for a hit rate of 0.456 (MCE=0.5, Z = -1.51, ES(trials) = -0.087, ES(sessions) = -0.302). The difference in trial effect sizes between the OE and NOE conditions was $\Delta ES = 0.099$ (SD theory = 0.073, Z = 1.35, P-value = 0.09). The hypothesis was not confirmed.

Hypothesis III. The session effect size in the OE condition conformed to null expectation (ES = 0.0537, SD theory = 0.089, SD expt = 0.19). Thus, the hypothesis that the OE session effect size will exceed the Ganzfeld effect size was not confirmed.

Secondary Analyses

Hit rate variability. The above hypotheses concerning the trial effect size use the average hit rate to test for the presence of psi. It is conceivable that the null average hit rate obtained was due to a combination of psi-hitting and psi-missing during the sessions.. This can be investigated by testing for variations in the hit rate distribution as a function of different experimental conditions.

Each trial is uniquely identified by the photograph used in that trial, the position of the trial within the session and the session participants. The hit rate distributions can thus be tested against the null hypothesis by grouping trials according to the trial photographs, the within-session trial position, and the participants. This gives three separate factors that could influence the hit rate variability. We tested the hit rate distributions against these factors in both the OE and NOE conditions using a Pearson chi-squared goodness-of-fit test and a Monte Carlo test of the variance. Table 3 shows P-values for the test results.

Protocol :	OE		NOE	
Statistical test :	χ	σ^2	χ	σ^2
Photo-ordered grouping	0.64	0.02	0.28	0.52
Trial-ordered grouping	0.03	0.83	0.5	0.91
Participant-ordered grouping	0.89	0.43	0.27	0.54

Table 3. One-tailed P-values for Pearson chi-squared goodness-of-fit tests and Monte Carlo variance tests of the trial hit rates according to the different grouping schemes. (trials grouped by photograph, within-session position, or participant) While all of the NOE cells are within null expectation, two of the OE cells have low probability values.

For the hit rate variability tests in the OE condition, we ran a Monte Carlo simulation to estimate the probability of finding 2 out of any of the 6 tests with P-values of 0.03 and 0.02, or less. The simulation yields a significant overall P-value of P= 0.012, with a 90% confidence interval of (0.007, 0.017).

Photo selection rate. The psi task in our telepathy protocol is to distinguish between an unknown photograph which is cognitively and perceptually dense and a known, neutral gray form. A natural question is whether the engaging character of the photographs induces a selection bias in the receiver's choice at the time of judging, irrespective of which image is actually the target. The photograph selection rates and one-tailed P-values in the NOE and OE conditions are NOE : 152/298 = 0.524 (P-value = 0.38), and OE : 266/500 = 0.532 (P-value = 0.08). Thus we do not a significant bias in the selection rate of photographs by the receiver in either condition, though the OE condition is suggestive of such a bias.

DISCUSSION

The Sharefield Experiment. Of the three hypotheses posited for the telepathy protocol, only (II), predicting significantly higher results in the OE versus NOE condition, received some marginal - but non-significant - support. Note also that this result is mostly due to poor participant scoring in the NOE condition, rather than strong scoring in the OE condition.

While it is disappointing that none of the hypotheses were confirmed, the secondary analyses comparing OE vs. NOE results provide tentative evidence for effects associated with the optimization procedures alone. The tests focused on three factors known to impact effect sizes in psi tasks: target quality, subject ability and position effects. As shown in Table 2, two of the tests are significant under the OE condition, a result shown to be significant through a Monte Carlo simulation (see Results). By contrast, no results were significant in the NOE condition. Of course, we should be cautious about over-interpreting these post-hoc analyses. Still, they do offer some encouragement for the Sharefield protocol, and more specifically, for the OE condition. It seems plausible to entertain the possibility that psi was not entirely absent in this condition but that certain factors contributed to a high hit rate variability, over the course of each session. In this context, the qualitative feedback from our 50 volunteer participants (during the post-session debrief) provided some useful indications as to what may have contributed to this high hit variability, rather than stable positive scoring. We list these potential factors in order of importance.

The HMD system. A significant issue was the physical discomfort caused by the Sony Head Mounted Display. All the investigators had tried the HMD, prior to our decision to adopt this hardware for the experimental sessions, and had found it quite comfortable. Yet, while most participants reported appreciating the absorptive qualities it afforded, about 50% reported moderate to significant discomfort with the HMD in terms of its weight and pressure on their nose and forehead. Some stated that the discomfort grew increasingly disturbing over the course of the session. In future implementations of the Sharefield, it will be essential to improve the comfort of the HMD system, or find an alternative.

The judging process. Participants had different reactions to the judging process. A number reported that the presentation of images during the judging period, and particularly that of the photograph, disturbed their sense of immersion in the Sharefield OE. Participants indicated during the debriefings that the sensory/emotional experience provoked by viewing the photograph often overwhelmed their felt experience of the sender. This led them to confuse their own reactions to the photograph with what they sensed about their partner, and distracted them from their initial intuitions. An interesting alternate approach to the judging task in a future study could thus be to suppress the presentation of target images altogether and to have participants simply indicate whether the target was the neutral one, or an emotionally charged image.

Feedback. Feedback was provided for both participants after each trial in order to facilitate a possible psi-task learning. While a few participants felt they were indeed using feedback in this manner, for nearly half the participants, feedback was perceived as more of a hindrance than an advantage as it induced a sense of stressful self-judgment and anxiety. An option for future studies is to suppress the real-time feedback, either uniformly for the study, or as a participant option after experiencing feedback in a training session.

Target Qualities. As mentioned in the Secondary Analyses, we also examined whether there was a possible selection bias in the OE or NOE judging phase, favoring photographs over the neutral image. While the result for both conditions was nonsignificant, for the OE condition it did approach significance ($p=0.08$), suggesting there may have been a participant bias favoring the selection of photographs over the gray form. Additionally, in a review of all photograph-targets during the post-session debrief, participants suggested that certain photographs were emotionally too neutral, i.e., difficult to distinguish from the gray form. Together, these quantitive and qualitative findings suggest that future Sharefield protocols must be based on a target set with consistently forceful imagery (rather than targets showing a range of emotional hues, as in the present experiment).

Long-term prospects for a psi-research tool. As mentioned in the Project Rationale, the Sharefield experiment was a first exploration of the potential of our approach, that integrates multiple-trial ESP tasks and subject optimization procedures within a fully automated protocol.

For this first investigation we opted for a dyadic-ESP protocol (hence the name Sharefield), which was probably the most challenging of all possibilities (both from a technical and from a human resources perspective). But in the long run, we are interested in using our approach in different psi research contexts, including clairvoyance, precognition and micro-PK. The modular software approach adopted affords a highly interactive development environment, facilitating changes deemed necessary or addressing different research issues.

In this context, the results of this first study, along with the participants' qualitative feedback, provide a rather clear cut picture of the directions that should be taken to enhance our approach.

In terms of dyadic ESP / telepathy studies, we intend to change the judging and feedback procedures, so that the receiver focuses less on performance, and more on the flow of the experience. Thus for judging, the receiver will be asked to simply decide whether their partner saw the gray form or a complex image and they will not receive immediate feedback; instead, participants will receive only global feedback at the end of the session. We also will re-evaluate the target pool, and replace a few of the current images with images that are emotionally more intense. Finally, we wish to explore alternatives to the Sony HMD system : we either need to find a product that can better adapt to individuals' idiosyncratic morphology, or explore alternative systems. In all cases, however, we intend to maintain the immersive quality of the OE condition, which appears to have contributed considerably to participants' state.

From a broader perspective, we intend to explore single-subject psi protocols (i.e., including microPK, clairvoyance or precognition). We believe that the overall approach is particularly well adapted for such experiments, which are considerably simpler to program and execute, and hence more amenable to inter-laboratory replications.

In this context, we are encouraged by the qualitative feedback coming out of the participant debriefings. A clear majority expressed strong interest in returning for more sessions. The optimization procedures seem to have fluidly integrated into all stages of the experimental trials, and practically all participants under-estimated the duration of their sessions - a sign that they found the experience engaging rather than tedious. Also, judging from their reports, the relatively sustained rhythm of 20 trials / session did not perturb the optimization experience - suggesting that in single-subject experiments, the trial rate may be increased. We thus believe that our approach holds considerable promise as a flexible and powerful tool for future psi research.

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