Final Report: Bursary 356/2020

Abstract

Psi@Home: A Platform for Psi Research

Background: Replication of results and theory development are two major challenges for psi research. Replicability is arguably more critical since advancing theory requires reliable experimental input.

Aim: Psi@Home (P@H) seeks a better platform for psi experiments. In our view, protocols must produce effects reliably and be practical to implement. While proven psi protocols exist (e.g. the Ganzfeld), experiments are onerous to replicate. A well-powered Ganzfeld replication needs >500 sessions, takes several years to complete and requires considerable prior expertise. This sets a high bar in terms of resources for researchers within and outside the field.

We innovate on 3 essential protocol elements: subjects, the experimental setting and the psi task. P@H establishes selected cohorts who are available for multiple experiments. Experimental sessions are done independently at home on a downloaded app which removes geographical limitations and allows a comfortable setting. The app can be modified to create different experiments. P@H provides protocols that are flexible and transferable to other researchers.

Method:

1. Develop the P@H platform for data acquisition and cohort management.
2. Test the psi task with a meditator cohort.
3. Test transferability with surrogate researchers who create an independent cohort.

Results: Registered experiments with two cohorts were successfully completed in 6 weeks. Data showed a psi effect for 1 out of 3 pre-stated hypotheses. Notably, the main hypothesis was highly significant p=.00004 on 90 sessions collected during recruitment.

Conclusion: We have shown that P@H is a viable platform for psi collaborations. Further work is needed to better stabilize psi effects.

Aims

Bursary Grant 2020/356 (Psi@Home) developed a platform for psi experiments with cohorts. The long-term objective is to achieve a platform that allows psi experiments to be done more quickly and reliably, and which can be a resource for researchers new to parapsychology.

Skepticism towards psi research persists due to two perennial obstacles: the difficulty to replicate results and the lack of convincing theoretical models. Replicability directly impacts research programs and it is arguably the more critical issue since theoretical advances rely on the quality of experimental data. When psi effects are difficult to produce and replicability is poor, it is challenging to acquire the empirical input needed to move theory forward.

The Psi@Home program seeks to improve replicability by building a new platform for parapsychological studies. We start with a reassessment of what makes for a successful experimental protocol. In our view, psi protocols must do more than produce consistent results. Protocols must also be replicable from a practical standpoint. Parapsychology has not produced an adequate protocol in this sense. A case in point is the auto-Ganzfeld which has repeatedly produced positive evidence

for psi since the 1980s. However, a well-powered replication (given the effect size of ~0.1) requires over 500 Ganzfeld sessions, each taking several hours to set up and run. Such an undertaking would need several years to accomplish and require considerable prior know-how on the part of the researchers. In terms of resources and knowledge, this sets a high bar for outside researchers to enter the field. Therefore, practical protocols are needed so that scientists both within and outside of parapsychology can pursue research free of overly high demands on resources.

Accordingly, the primary aim of Psi@Home is to develop an approach to experimentation where the resource demands are lower and the expectations for success are higher. Furthermore, we seek a flexible approach that can be adapted to the many experimental questions that need to be addressed so that projects can extend beyond mere replications. Crucially, experiments must be realizable by outside researchers. This means that studies need to be both suitably matched to typical university resources and achievable for scientists new to the field. We term this aspect *protocol transferability*, and it is an essential element of the program.

The Psi@Home platform takes a modular approach, designing protocols that aim to be reliable, flexible, and transferable. To achieve this, we focus on three basic protocol elements and innovate on each: the psi subjects, the psi task, and the experimenter's role.

Regarding subjects, the solution envisioned is to use selected cohorts as participants and to arrange for cohort participants to do experimental sessions from home. The innovation is that, structured in this way, cohorts can participate in multiple experiments without geographical constraints, and be available as resources for interested researchers.

Cohort members may be selected for their potential to produce psi effects, for psychological traits deemed relevant to psi performance, or other characteristics of interest for research. Because people the world over can participate, selective criteria can be employed to create better-performing, or highly specific cohorts. Cohort members are available for experiments on an ongoing basis, and not just for a one-off experiment.

Cohort management is achieved through web technologies. An interactive website allows for informing, contacting, and scheduling cohort members. Online meetings are used to create a personal rapport with each member – a factor that may enhance successful psi experimentation.

Regarding the psi task, the Psi@Home autonomous data collection system lessens the demand on resources and reduces laboratory overhead. An experimental task to test for psi is integrated into a downloadable application installed on participants' home computers. The task can be modified to address different experimental questions. The task innovations include the at-home setting for participants, and the fact that new or modified experiments can be easily deployed to cohorts familiar with the platform.

Finally, external research groups can use the Psi@Home platform to perform replications or design modified or entirely new experiments. Access to the platform allows for collaboration with existing cohorts, or to create entirely new cohorts. An implicit aspect of transferability is the tacit knowledge required to run psi experiments. This includes to how experimenters interact with participants. To address this, the policy of Psi@Home is to require researchers to first collaborate on an experiment with the Psi@Home team so that the tacit knowledge of working with psi participants can be transferred along with technical details of the data collection

and cohort management systems. After an initial collaboration, outside researchers receive a private system account and can proceed with experiments independently.

Psi@Home protocols can address different hypotheses by modifying one or another of these elements: the cohort, the task or the experimenter group. Studies can be completed rapidly by scheduling participants in parallel. Transferability is supported since the psi application, cohort management system, and the cohorts themselves are available to outside researchers.

To achieve the goals of Grant 2020/356, three principal tasks were identified:

1. Development of the Psi@Home platform.
2. Testing the Psi@Home platform with a cohort of advanced meditators.
3. Design and testing of transferability to other researchers.

Methods

Development of The Psi@Home platform

A laboratory-based application for a binary psi (precognitive) task was previously developed and tested under Bial grant 506/2014. For the current project, the application, named the *Selfield*, was ported to a package for at-home use by cohort members. Development included:

1. Development of **control software** for the *Selfield*; user login and logout; connection to the Amazon cloud **AWS database system**; security measures; a user option for practice sessions.
2. Development of an **installation package** to deploy the *Selfield* locally on participants' computers.
3. Design of a **website** for cohort management. The website, imiresearch.fr, includes public pages for cohort recruitment; sign-up forms for cohort candidates; functionality for cohort management; and, an online calendar for scheduling video meetings with cohort members.

Cohorts

A. Test of Cohort Recruitment via a Pilot Study

Cohort recruitment has two steps. People are contacted by various means of outreach and directed to the website where interested persons can sign-up as cohort candidates. Next, to join a cohort, candidates must complete a try-out of Psi@Home by doing two full sessions of the *Selfield* within a week's time. After finishing the two test sessions, those who wish may formally join the cohort. The try-out is meant to cull unmotivated candidates. Members are informed that, while they will be invited to join in future experiments, they are under no obligation.

The Cohort recruitment procedure was first tested with 5 meditators personally known to the PI. Their feedback allowed to refine and clarify the process from a user perspective.

Data from the 10 try-out sessions were used to test analysis procedures in preparation for the formal experiments to come.

B. Creating the Cohorts

1. Meditator Cohort. Candidates were contacted personally by the PI using a database of highly experienced buddhist meditators to which the PI has access.
2. Open Cohort. Psi@Home team members who were not part of the technical development were tasked with creating a general public cohort, named the Open cohort. The cohort involves some implicit selection, since it is drawn from people with a prior interest in parapsychology. Building the Open cohort by non-technical team members allowed to assess aspects of protocol transferability since outside researchers may want to create their own cohorts.
3. Psi Arts Cohort. Although not planned in the grant application, a third cohort was opened for persons with training in remote viewing, mediumship or other "psychic arts".

Experiments

Experiments with the Meditator (and including Psi Arts) cohort and the Open Cohort were completed over the course of 6 weeks, beginning on Oct 18, 2022. Participants did 4 to 6 *Selfield* sessions and a total of 80 sessions per cohort was required by the pre-registration.

Each formal *Selfield* session consisted of 20 trials that involved interacting with a target on the computer screen. Participants were asked to choose the moment to reveal a target inside a presented target container. With a mouse click, the container was revealed to be either empty, or the striking image of a personage was shown. An empty container is considered a 'miss' and finding a personage, a 'hit'. Each instance of hit or miss was determined by a pseudo-random process that was seeded anew for each trial using input from the milli-second timing of mouse clicks. After the reveal, the *Selfield* proceeded to the next trial until all 20 trials were completed. A session lasted about 15 minutes, but participants took as long as they wished to complete the trials.

Participants were instructed that the experiment tests for psi and that their intention should be to "meet as many personages as possible", that is, obtain hits. The null expectation in the absence of psi was a 50% hit rate. The psi effect tested by the *Selfield* is a biasing of the hit rate. The task is considered precognitive because the pseudo-random process to determine a hit or miss occurs only after each user input (mouse click).

Three types of 1-tailed hypothesis tests were set:

A) Cohort variances of session hit counts > null expectation, significant at 0.05.

B) The Meditator cohort variance greater than the Open variance at the 0.05 level.

C) Cohort hit rates >50%, at the 0.05 level on a direct binomial test.

The experiments were pre-registered with the Koestler Parapsychology Unit Study Registry. P-values for A) and B) are determined from Monte Carlo (MC) estimates.

Based on earlier laboratory-based studies with the *Selfield*, power estimates originally called for acquiring 240 sessions of 40 trials each, per cohort. However, an extremely strong result from preliminary data collected during the recruitment process lead to a revised protocol that was accepted by the Bial scientific committee. Under the new protocol, the number of sessions for each experiment was reduced to 80, and participants were asked to complete 4 to 6 sessions of 20-trials each.

Psi-missing Analyses

The variance hypotheses accommodate a scenario that includes psi-missing (ie., a psi effect giving low hit rates). If some participants successfully produce high hit rates while others produce anomalously low hit rates, tests of the total hit rate can fail to show an effect, even though one is present. In this case, excess variability in session hit rates can reveal the combined hitting/missing effect. Other psi-missing scenarios are possible. A theoretical goal of the grant is to investigate statistical methods to detect psi-missing in forced-choice data, such as those produced in the planned experiments.

Monte Carlo techniques explored different statistics sensitive to psi-missing and power estimates for the tests were made.

Results

1. Results of Platform Development: The Psi@Home platform was completed successfully in May 2022, including:
    - the public website (imiresearch.fr) with functionality for cohort recruitment and management.
    - the downloadable at-home *Selfield* application, with updated features.
    - an installer package for the *Selfield* application.
    - the interface to the Amazon Web Services cloud for real-time data storage and management.
2. Results from Cohort Recruitment: Two cohorts were successfully established.
    - Pilot Study: Five experienced meditators tested the recruitment and experimental procedures under real-world conditions. Each completed two full experimental sessions, as required to join a Psi@Home cohort, and provided feedback on the procedures.
    - Pre-analysis: Analyses were tested successfully on the 10 sessions of 20-trials each. Mean and variance tests yielded : (Mean: 0.48, N=200, p=0.78; Variance (ChiSquare): 20.4, df=10, p=0.026).
    - Meditator Cohort: Recruitment for the Meditator cohort continued until early October 2022. Of 81 persons contacted, 20 installed the Selfield application and 19 joined the Meditator cohort. Each recruitment entailed multiple email exchanges and a 45-minute Zoom meeting with a team member. The Meditator cohort generated 36 try-out sessions during recruitment as preliminary data.
    - Psi Arts Cohort: Recruitment for the Psi Arts cohort was conducted August to October. Persons contacted through online conferences and publicity in collaboration with the International Remote Viewing Association. 19 persons installed the Selfield application and 15 joined the Psi Arts cohort. The Psi Arts cohort generated 31 try-out sessions during recruitment.
    - The registered study with 80 Formal sessions from the combined Meditator/ Psi Arts cohort was successfully completed by the PI.
3. Result for Test of Transferability: A registered study was completed by non-research staff.
    - A team of two Psi@Home staff with little research experience were introduced to the platform and tasked with recruiting a general public cohort.

- The team contacted candidates via parapsychological email lists in France. 31 persons installed the Selfield application and 24 joined the Open cohort. The Open cohort generated 59 Formal sessions during recruitment.
- The team successfully completed the registered study with 80 Formal sessions from the Open cohort.

4. Results of Registered Experiments:
   - The formal pre-registered studies were completed within 6 weeks, meeting the Psi@Home design goal of making studies easier and faster to complete.
   - The protocol was revised after the analysis of 50 try-out sessions from cohort recruitment gave a strong result for the variance hypotheses A (Tables 3 and 4). The registration then set hypotheses A as confirmatory and hypotheses B and C as exploratory.
   - The registered studies yielded non-significant results for hypotheses A and C. Hypothesis B (a greater variance for the meditator cohort) tested borderline significant (Tables 1 and 2).

Table 1

Confirmatory Tests of Session Variance for 160 registered sessions				
Hypothesis	Sessions	X^2	MC p-value	X^2 P-value
A1: Meditator Cohort	80	89.43	0.218	0.221
A2: Open Cohort	80	59.39	0.963	0.659
Exploratory Test of Variance Difference between Cohort Sessions				
Hypothesis	Sessions	X^2 difference	MC p-value	Conover rank
B: Cohort difference	80 / 80	30.04	**0.042**	0.056

Tests of Variance for registered experimental sessions. Variances are calculated as: the number of successful trials (hits) for each session are converted to a standard normal score. The standardized scores are squared and summed to yield a (approximate) X^2 statistic of sessions for the cohort. A p-value is estimated from Monte Carlo simulations (MC p-value). The table also shows a theoretical X^2 p-value based on the ChiSquare distribution with DF=20. The MC value is more accurate (for technical reasons, such as a few sessions having < 20 trials), and the theoretical value is given only as a check. Note that the difference in cohort variance (B) is marginally significant.

Table 2

Exploratory Tests of Trial Hit Rate for 160 registered sessions				
Hypothesis	**Trials**	**Hits**	**Mean Hit Rate**	**Binomial p-value**
C1: Meditator Cohort	1597	780	0.488	0.83
C2: Open Cohort	1593	825	0.518	0.080

Exploratory tests of the average hit rate for each cohort. The tests were not significant. The p-values are exact binomial calculations. On occasion, data trials failed to upload due to intermittent home WiFi, and recorded trials are slightly less than 1600 for each cohort.

Table 3

Results for Recruitment Try-out Sessions				
Variance Test	**Sessions**	**X^2**	**MC p-value**	**X^2 P-value**
All	90	150.72	**0.000038**	0.000064
Meditator Group	47	77.55	**0.0026**	0.003
Open Group	43	73.17	**0.0021**	0.003

Non-registered tests of Variance for 90 preliminary try-out sessions. The data are from groups of persons who joined a cohort and then participated in the registered study. The variance is significantly high for each group. The combined variance excess is equivalent to a deviation of nearly 4 standard deviations. The table is for all 90 try-out sessions generated by persons who participated in the registered experiments. The protocol revision was based on a slightly earlier calculation using the first 50 of these sessions. Those results are similar to the results shown in the table.

Table 4.

	Results for Recruitment Try-out Sessions			
Trial Hit Rate	**Trials**	**Hits**	**Mean Hit Rate**	**Binomial p-value**
All	1789	905	0.506	0.318
Meditator Group	935	454	0.486	0.820
Open Group	854	451	0.528	**0.054**

Non-registered tests of the average hit rate for try-out sessions. Tests were not significant, although the Open group was nearly so.

Table 5

Results for All Data from Study Participants				
Variance Test	**Sessions**	**X^2**	**MC p-value**	**X^2 P-value**
All	250	302.74	**0.011**	0.013
Meditator Cohort	127	170.18	**0.006**	0.007
Open Cohort	123	132.56	0.259	0.262
Exploratory Test of Variance Difference between Cohort Sessions				
	Sessions	X^2 difference	MC p-value	Conover rank
Cohort difference	127 / 123	34.33	0.081	0.130

Non-registered exploratory tests of Variance for 250 sessions. Combined data from recruitment and the registered experiment by all persons participating in the study. Variance test is significant for all data and individually for the Meditator cohort. The variance is higher for the Meditator cohort, consistent with hypothesis B, but the X^2 test fails to reach significance.

5. Results of Psi-missing Analysis:

The presence of psi-missing undermines the ability to detect psi. When hitting and missing are balanced, as appears the case for the Psi@Home data, the power of

first-moment statistics, such as mean tests quickly tend to zero. In this case, 2nd-moment tests can reveal a psi effect, but with considerable power loss. Figure 1 show how mean tests rapidly loose power as the proportion of missing increases, as do, to a lesser degree, binned distribution tests such as the Pearson Chi-Square. We have opted for a zero-mean test of variance which has a constant power as the missing proportion varies. At 50% missing, the zero-mean variance is much more powerful than the Pearson test.

Other psi-missing tests were examined, notably tests of tail occupations and kurtosis. The zero-mean variance was the more powerful test in all cases (Figure 2).

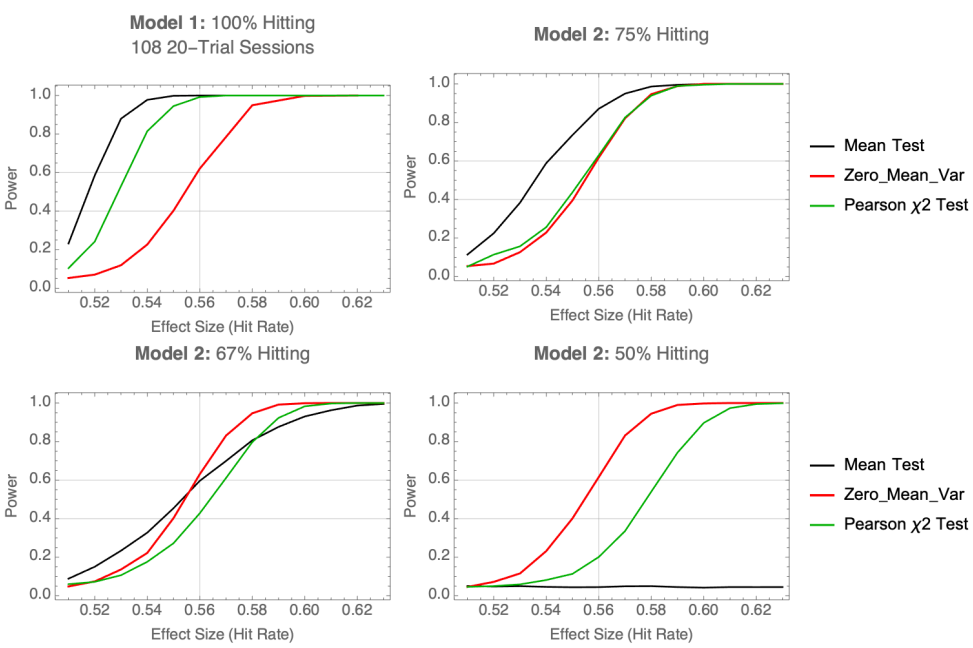

Figure 1. *Comparison of powers for generic statistical tests*. Curves show powers for 108 simulated data sessions when effect sizes (as hit rates) range from 50% to 64% for 3 different tests (here, an effect size of 0.55 means the hitting proportion has a 55% hit rate and the missing proportion a 45% hit rate). The panels show different proportions of psi hitting to missing: 100% hitting, 3:1, 2:1, and 1:1 (clockwise from upper left).

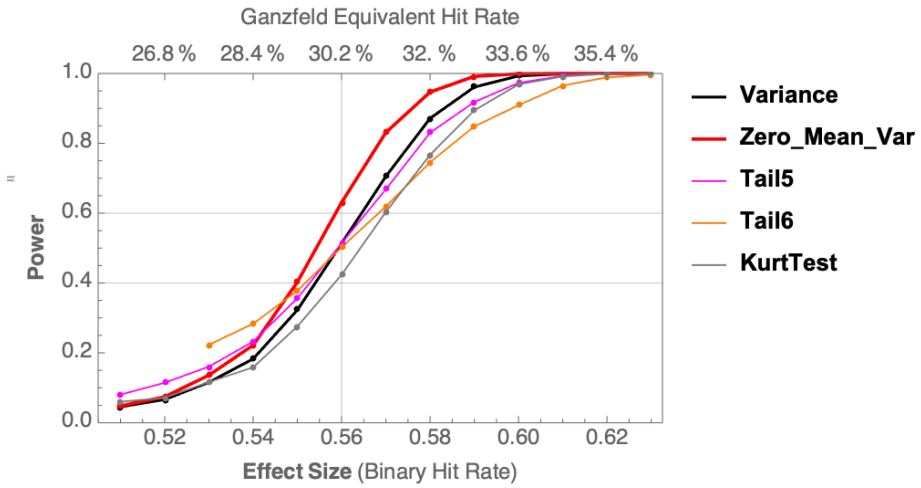

Figure 2. *Comparison of powers for tests at 50% psi-missing*. Curves show powers for 108 simulated data sessions when effect sizes of hit rates range from 50% to 64%. The zero-mean variance is the most powerful of the tests considered. The tests Tail5 and Tail6 refer

to tests of occupations of session hit counts in the tails of those distributions. KurtTest is a test of the Kurtosis (4th distribution moment).

Discussion

After extensive development (and pandemic challenges), cohort recruitment began in June 2022 and the two registered experiments launched in October. Their rapid completion – within six weeks – is a major success of the Psi@Home platform. The experiments went smoothly, and team involvement needed only an hour or so per day during this period. This met the goal of reducing overhead in psi experiments. The recruitment, in contrast, was somewhat challenging. A clear disadvantage was that the application ran on Apple computers and this limited the number of cohort candidates. More time and effort than expected was spent on individual application installation with participants in video meetings. However, we consider this a feature and not a bug of the Psi@Home approach. It contrasts with online experiments that lack experimenter-participant interactions. The video encounters were multi-purpose, serving technical, administrative and psychological ends. Importantly, the meetings allowed personal connections with team members that were motivating for participants.

Conceptually separating the cohort recruitment and study participation proved advantageous. Candidates appreciated that an initial try-out was required, and that subsequent study participation was entirely voluntary. Recruitment also permits to accumulate a considerable amount of data, as two full sessions per candidate are recorded under what are essentially experimental conditions. A difference between recruitment and study data is that the participants (and experimenter) clearly have lower expectations and this may have a beneficial psychological impact on psi performance.

Indeed, the most striking result of the project was the stark difference in performance between these data sets. The simplest reading is that the registered experiment produced a null result (albeit with one test marginally significant), while the recruitment data showed a 4-sigma variance effect. One explanation is that the pressure to perform during the registered study inhibited psi performance. The speculation is supported by post-study reports from the cohorts that often included remarks about time constraints and the stress to complete the 4 to 6 required sessions. An answer must wait for further studies that address this possibility.

Conclusion and Recommendations

We conclude that Psi@Home is a viable platform for running psi experiments. It's efficiency and transferability have been demonstrated by the project. Although the registered study did not yield the hoped for result, the strength of the variance deviation in recruitment data indicates the *Selfield* protocol can produce a psi effect. Many recommendations can be make. Several priorities are:

1. A replication, with the recruitment of new cohort members, should be undertaken.
2. To ease recruitment, the application should be ported to run on PCs.
3. A separate replication with original cohort members should be undertaken, but with an easing of the pressure to produce 4 to 6 sessions in 6 weeks.

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Keywords:
psi, precognition, replicability, cohort, meditation

Summary of Outputs
Expected and achieved output indicators

Output	Expected	Achieved
Conference presentation	1 Presentation	3 Presentations: 1. *Two Problems for Parapsychology, One Solution, and How You Can Help*. International Remote Viewing Association (IRVA) conference, Online July 24, 2022. 2. *More then Meets the Eye: Detecting Psi-missing*. Parapsychology Association (PA) Conference 2023, Oslo 3. *Psi@Home: A Platform for Psi Experiments*. PA Conference 2023, Oslo
Conference paper	1 Paper	2 Peer-reviewed conference papers: Paraspsychology Convention, August 3-6, 2023, Oslo, Norway. https://parapsych.org/uploaded_files/pdfs/00/00/00/01/26/2023_pa_abstracts_of_presented_papers.pdf 1. *Detecting Psi-missing in Forced-Choice Data*. 2. *Psi@Home: A Platform for Collaborative Psi Research*.
Journal article	2 Peer-reviewed papers	2 Papers in preparation: 1. Precognition experiments with Selected Cohorts 2. Statistical Approaches to Psi-missing
Peer reviewed study preregistration	1 Registration	1 Registration accepted by the Koessler Parapsychology Unit (KPU) http://www.koestler-parapsychology.psy.ed.ac.uk/Documents/KPU_Registry_1072.pdf
News article	0	1 News article in French press: La flèche du temps : l'exaltante exploration d'un mystère"*, 2022, in* ***Inexploré Nº 56*** https://www.inexplore.com/articles/fleche-temps-exaltante-exploration-mystere-premonitions-paradoxe-science
Online presentation	0	2 Presentations: 1. *A New Experimental Paradigm for Psi Research: Psi@Home*. IONS event. March 10, 2023. *https://noetic.org/event/psihome/* 2. *A New Experimental Paradigm for Psi Research: Psi@Home*. IRVA Workshop Oct 4, 2023
Pre-registered study report	0	1 Pre-registered study report uploaded to KPU: http://www.koestler-parapsychology.psy.ed.ac.uk/Documents/KPU_1072_Results.pdf