Explore xxx (xxxx) xxx

Contents lists available at ScienceDirect

EXPLORE

journal homepage: www.elsevier.com/locate/jsch

Who's calling? Evaluating the accuracy of guessing who is on the phone☆

Helané Wahbeh *, Cedric Cannard, Dean Radin, Arnaud Delorme

Research, Institute of Noetic Sciences, Petaluma, CA, USA

ARTICLE INFO

Keywords:
Anomalous cognition
Telepathy
Precognition
Telephone

ABSTRACT

Some people claim to occasionally know who is calling them without using traditional means. Controlled experiments testing these claims report mixed results. We conducted a cross-sectional study of triads examining the accuracy of knowing who was calling using two randomly selected designs: 1) a web server randomly chose the caller before the callee's guess (telepathic/pre-selected trials), and 2) a web server randomly chose the caller after the callee's guess (precognitive/post-selected trials). We also performed exploratory multilevel mixed-effects logistic regressions on the relationship of genetic relationships, emotional closeness, communication frequency, and physical distance data with accuracy. A total of 177 participants completed at least one trial (105 "completers" completed all 12 trials). Accuracy was significantly above chance for the 210 completers telepathic/pre-selected trials (50.0% where the chance expectation was 33.3%, $p<.001$) but not the 630 completers precognitive/post-selected trials (31.9% where the chance expectation was 33.3%, $p = .61$). We discuss how these results favor the psi hypothesis, although conventional explanations cannot be completely excluded. Genetic relatedness significantly predicted accuracy in the regression model (Wald $\chi2 = 53.0$, $P < .001$) for all trials. Compared to 0% genetic relatedness, the odds of accurately identifying the caller was 2.88 times (188%) higher for 25% genetic relatedness (Grandparent/Grandchild or Aunt/Uncle or Niece/Nephew or Half Sibling; $\beta = 1.06$, $z = 2.10$, $P = .04$), but the other genetic relatedness levels were not significant. In addition, communication frequency was significant ($\beta = 0.006$, $z = 2.19$, $P = .03$) but physical distance ($\beta = 0.0002$, $z = 1.56$, $P = .12$) and emotional closeness ($\beta = 0.005$, $z = 1.87$, $P = .06$) were not for all trials. To facilitate study recruitment and completion, unavoidable changes to the protocol were made during the study due to persistent recruitment difficulties, including changing inclusion/exclusion criteria, increasing total call attempts to participants, adjusting trial type randomization schema to ensure trial type balance, and participant compensation. Thus, future research will be needed to continue to improve the methodology and examine the mechanism by which people claim to know who is calling, as well as factors that may moderate the effects.

Significance Statement

We observed significantly above-chance results for trials in which the web server pre-selected the callee, and the caller was asked to direct their attention toward them, aligning with results from previously reported studies. Communication frequency between pairs of people was also associated with greater accuracy. The influence of emotional closeness and genetic relatedness did not appear to influence accuracy. Our findings add to the mixed results on these potential relationships. Continued research is needed to evaluate claims that people sometimes know who is calling without any conventional cues.

Data availability

The data that support the findings of this study are available in Figshare at http://doi.org/10.6084/m9.figshare.21521235.

Introduction

Your smartphone rings. The generic ringtone gives no clue about who is calling. As you reach for the phone, you suddenly think about a friend you have not spoken to in years. You answer and find to your shock and delight, that your long-lost friend is on the other end of the

☆ Classification: Biological, Health and Medical Sciences/Psychological and Cognitive Sciences.

* Corresponding author at: Institute of Noetic Sciences, 7250 Redwood Blvd, Suite 208, Novato, California 94945 USA.
E-mail address: hwahbeh@noetic.org (H. Wahbeh).

https://doi.org/10.1016/j.explore.2023.08.008
Received 18 May 2023; Received in revised form 17 August 2023; Accepted 22 August 2023
Available online 25 August 2023
1550-8307/© 2023 Elsevier Inc. All rights reserved.

line. On another occasion, you find yourself spontaneously thinking about someone. They call you a short time later. Consider this experience reported by Denis G., a 60-year-old resident of California:

In 1980, I took a motorcycle trip across Africa. At 4 am, while camping in Swaziland, I awoke from a vivid dream in which my sister said to my mother, "It has been six months since we heard from Denis. Let's send him good vibes so he calls home." I was compelled to get out of my sleeping bag, ride my motorcycle into the nearest town, and find an open hotel, and call my mother in Kansas City. My sister answered the call and told me, "Just one minute ago, we were sitting on the end of mom's bed, sending you vibes, hoping you would call home." I received their intention 9000 miles away, an hour before they sent the message. This experience changed my life and my outlook on what is normal or not. I am convinced telepathy was involved. I changed my job and career because of that experience.[1]

Approximately 37 - 78% of respondents in the United Kingdom[2] and California[3] endorse this "telephone telepathy" experience. 'Telepathy' was coined in 1882 as "the communication of impressions of any kind from one mind to another, independently of the recognized channels of sense".[4] In two recent surveys, we found that 57%[5] and 71%[6] of respondents reported feeling that they were mentally in touch with someone far away from them without using traditional means. Prevalence of this phenomenon noted in other large global studies ranges from 34% in Europe, 54% in the US,[7] and 42% in the United Kingdom.[8]

Some of these experiences are undoubtedly due to a combination of coincidence, selective memory, expectation, and subconscious anticipation from temporal regularities of calls with certain people. By chance, someone that you thought of may happen to call, and you forget the other many times that this was not the case. Also, knowing a person's routines and activities lets you guess when they are likely to call. However, when a caller's intention focuses on the person they are calling, is some information transfer process, in fact, happening? One way to answer that question is to devise controlled studies to rule out mundane explanations.

Before reviewing previous telephone telepathy studies, examining non-telephone telepathy experiments informs work already done on this phenomenon. Multiple laboratories worldwide have tested for telepathy in situations that do not involve phone calls using a laboratory protocol called the "ganzfeld" (i.e., "whole field" in German). Gestalt psychologists developed the ganzfeld method in the 1930s as a sensory deprivation technique used to study mental imagery. It was later adopted for telepathy research in the 1970s. The idea was that if the mental transfer of information occurred, it might consist of subtle impressions that would be easier to sense by reducing extraneous sensory stimuli.[9,10] While there are some variations in the standard ganzfeld telepathy protocol, common elements include enveloping the participants in low-level, unpatterned sensory stimuli, such as placing translucent covers over the eyes, shining a red light on the eyes to create a homogeneous visual field, and playing pink noise over headphones to create a homogenous auditory field.[11]

A typical ganzfeld telepathy study protocol involves one individual (the "agent") tasked with mentally "sending" a randomly selected image to a distant, isolated person (the "percipient"). After 20 min or so, a separate researcher, blind to the target image, interviews the percipient about impressions they experienced during the "sending" period. The percipient is then asked to select one of four images they believe the agent was "sending" to them. These four images, including the one ultimately used as the target image, were pre-selected to be as different from one another as possible. This ganzfeld protocol has been tested in laboratories worldwide, usually with unselected participants. A meta-analysis of 113 studies from January 1974 to June 2020 found positive results (mean effect size = 0.09, Confidence Interval (CI) = 0.04 - 0.13, $p < .001$).[12] Significantly larger effect sizes were found with certain participants. For example, pairs of people who were emotionally close to each other, or those engaged in creative professions (e.g., music, writing), or meditators did better on the task.[13–16]

These controlled laboratory study results can inform about telepathy in general, but they are not the same as ecologically valid settings where "telephone telepathy" is reported. As of yet, no meta-analyses have been conducted on telephone telepathy. Thus, to explore this type of experience in the "wild," multiple studies evaluated the people's accuracy in guessing who was calling when the caller was randomly selected from a pool of possible callers. In one such study, researchers assessed the callee's accuracy rate for which of four possible people were calling.[17] In 571 trials, the overall success rate was 40%, significantly above the expected chance success rate of 25% ($p < .001$, 95% CI = 36 - 45%). The same researchers showed similar findings in additional studies (e.g., videotaped and with similar study designs using text messages, emails, and automated protocols on smartphones[18–25]), and some participants appear to perform exceptionally well (40% accuracy with 25% expected; ($P = .007$).[26]

Other investigators have replicated these findings,[27] but not all laboratories have found above-chance effects.[26,28] For example, twenty-one participants were videotaped in the laboratory and guessed who, of four possible callers, was calling them every ten minutes.[28] They guessed 106 trials correctly (26.7%), which aligned with the 25% chance expectation. Another study evaluated eight participants' ability to guess who was calling and found a 30% hit rate when 25% was expected, although these results were not significant due to low statistical power.[26]

Despite some studies showing above-chance findings and some with non-significant or mixed results, the potential mechanisms underlying this apparent phenomenon still need to be understood. Two different mechanisms have been proposed. The first, the telepathic hypothesis, proposes that the callee knows who is calling them because the caller mentally "sends" information to the callee through intention. The second, the precognitive hypothesis, proposes that the callee knows who is calling them because they are perceiving that information from their own future. Researchers can evaluate these two hypotheses through aspects of study design. For example, if a web server randomly chooses the caller *before* the callee's guesses (we call this pre-selected) are made, the model may be considered telepathic. If the caller is randomly chosen *after* the callee guesses (we call this post-selected), the model is precognitive.

Meta-analytic results of non-telephone telepathy studies from 1992 to 2018 observed no difference between these two models.[16] But one study formally evaluated these two hypotheses for telephone telepathy. It did not find significant results for precognitive trials (240 hits out of 722 trials or 33.2% hit rate with 33.3% being chance level) but did find that participants performed significantly above chance for telepathic trials ($n = 2081$; $P<.001$).[29,30] Thus, more research is required to test the telepathic/pre-selected and precognitive/post-selected hypotheses.

In addition to the telepathic and precognitive hypotheses, other factors may play a role in the ability of people to guess who is calling them, such as caller familiarity, emotional closeness, the physical distance between caller and callee, communication frequency, and genetic relatedness. Familiar participants perform better in some telephone telepathy studies compared to unfamiliar participants.[28,31] For example, familiar callers had a 53% hit rate versus 25% for unfamiliar ones in one telephone telepathy study,[17] and familiar callers had a 61% versus 20% for unfamiliar ones in another.[24] However, these differences may be due to response bias[28,31] because participants guess familiar people more than unfamiliar ones, and other studies have found no difference in accuracy between familiar and unfamiliar callers.[26] Interestingly, the physical distance of the caller, even if familiar, did not influence success rates; for example, overseas callers, many of whom were closely bonded with the participants, had a 65% hit rate.[17] These results suggest that emotional closeness may be more important than physical proximity for the observed effects. Although some studies suggest that emotional closeness can affect the accuracy of identifying callers, there has been limited research on whether genetic relatedness is linked to emotional closeness or familiarity among participants. One online telepathy study

observed greater accuracy in genetically related caller/callee pairs although the results did not reach significance.[22] The association of genetics to phenomena like non-telephone telepathy has some evidence supporting it, but the results are very preliminary.[32,33] Further research is necessary to assess the correlation between these variables and the accuracy of telephone telepathy. This research could provide insight into how the phenomenon operates.

Other conventional explanations may also account for these intriguing results. Participants could cheat in studies where calls are not videotaped, or the researcher could inadvertently provide clues about the next caller. Improved results with familiar callers could be due to response bias or other predictable factors. Participants could guess who is calling based on the number of rings, the time of the day they answer, and the wait time to be connected in real-life settings.

Building on previous research on telephone telepathy, we attempted to address some of these issues and examine unanswered questions about telephone telepathy. We conducted a cross-sectional study of groups of three participants (triads) who tried to guess who was calling them in 12 trials, six of which the web server randomly chose the caller before the callee's guess (telepathic/pre-selected) and six of which the caller was selected after the callee's guess (precognitive/post-selected). The objectives of this study were to evaluate: 1) the accuracy of participants in guessing who was calling them, and any difference between telepathic/pre-selected versus precognitive/post-selected trials; and 2) the relationship between genetic relatedness, emotional closeness, communication frequency, physical distance, and accuracy.

Methods

The Institute of Noetic Sciences (IONS) Institutional Review Board (IORG#0003743) approved all study activities. All methods were carried out in accordance with relevant guidelines and regulations.

Pre-registration, participants, and recruitment

This study was pre-registered, and the protocol is available at the University of Edinburgh's Koestler Parapsychology Unit Study Registry.[34–37] Participants of varying genetic relatedness were recruited. Inclusion criteria included: 1) adults 18 years or older, 2) possession of a smartphone, and 3) English competency. Exclusion criteria, determined by self-report, included: 1) acute medical illness that would decrease the likelihood of study completion, and 2) mental illness such that symptoms would preclude participation. Every effort was made to recruit participants until 100 triads completed 12 trials (i.e., replace triads who have dropped out) or until the study data collection period was completed per the funders' guidelines. The experimenters were blind to the number of hits obtained throughout the entire data collection period, including when the decision to stop data collection was made on August 16, 2022.

Participants were recruited using the following resources: 1) Institute of Noetic Sciences (IONS) membership (~75,000) via eNewsletters, email, and the IONS website, 2) IONS associated social networks (~85,000 followers), 3) IONS affiliate organizations' social networks, and 4) various podcasts and media shows (e.g., Coast to Coast with George Noory). Most participants were compensated $240 for their participation.

Study procedures

Participant registration: Person A registered their triad through a HIPAA-compliant SurveyMonkey survey that they could complete on their computer or mobile device. They entered each person's first name, email, telephone number, gender, age, and relationship with the other participants (e.g., 0% unrelated; 12.5% - 1st Cousin OR Great-grandparent/Great-grandchild OR Great-Uncle/Aunt OR Great Nephew/Niece; 25% - Grandparent/Grandchild OR Aunt/Uncle OR Niece/Nephew OR Half Sibling; 50% - Parent/Child OR Full Sibling; 100% - identical twins/triplets).

Person A entered the following variables for each person pair, resulting in three sets for each variable for each triad. For example, in a triad of Mary, John, and Sue, all three pairs - Mary and John, Mary and Sue, John and Sue - had one value each for genetic relatedness, emotional closeness, communication frequency, and physical distance.

Informed Consent: All participants underwent an informed consent procedure consistent with the IONS Institutional Review Board guidelines. Person A underwent an informed consent procedure that included watching a video and reading the experiment's description through registration and passing screening criteria. Once the triad was registered, Persons B and C received a telephone call or text message describing the study activities (exact text available by first author upon request), which included study staff contact information so they could ask any questions or voice any concerns. Participants B and C had to acknowledge that they wanted to participate by responding affirmatively before the triad was enrolled in the study.

Measures: The emotional closeness, communication frequency, and physical distance measures were investigator-created items (i.e., not validated). Emotional closeness was rated using a slider anchored by 0 - Not at all, 50 - Moderately, and 100 - Extremely. Communication frequency was rated using a slider anchored by 0 - Never (Haven't talked to them in years), 50 - Sometimes (Once a month), and 100 - Very Frequently (Multiple times a day). Physical distance was entered in miles. Genetic relatedness was taken from the registration data.

Experimental protocol

All experimental trials were undertaken from an Amazon web hosting service using PHP and Twilio (https://www.twilio.com/en-us), an online telephone and SMS texting service with scripts to place calls, connect individuals and send text messages. The participants did not initiate any calls. For each trial, the web server randomly selected the pre- or post-selected path using the PHP pseudo-random generator. The automated procedure consisted of two paths (Fig. 1):

1. **Precognitive/Post-Selected:** The web server called all three participants (termed triad here) at the same random time. The web server waited for all three participants to be connected. If all participants did not answer, the web server told those who did answer that the trial was incomplete, and then it disconnected the call. If all participants answered, it asked each person to guess whom they would be connected to. Each participant pressed a number (i.e., 1, 2, 3) based on their guess (e.g., for Person B, the answer choices would be 1 = Person A, 2 = Person B or 3 = no one). The web server communicated the number corresponding to each person, which varied randomly with each call. After participants guessed, the web server randomly connected two of the three people and informed the third that they would not be connected for that trial. The next trial calling period began after the participants hung up.
2. **Telepathic/Pre-Selected:** The web server called two randomly selected participants of the triad (e.g., Person A). The web server then told Person A they would be connected to Person B and to please send their positive intention and focused attention to that person. The web server also asked Person B to guess to whom they would be connected (Person A, C, or no one). Please note that from Person B's perspective, the post-selected and pre-selected trials appeared to be identical (i.e., they could not tell if two or three people were included in the trial). Once Person B made their guess, the server connected Person A and B. If either did not answer or give a response, the trial was considered incomplete.

Fig. 1 represents the two randomized trial paths and participant instructions. For each trial, the triad is randomized to the pre- or post-selected path. Fig. 1A depicts the precognitive/post-selected path,

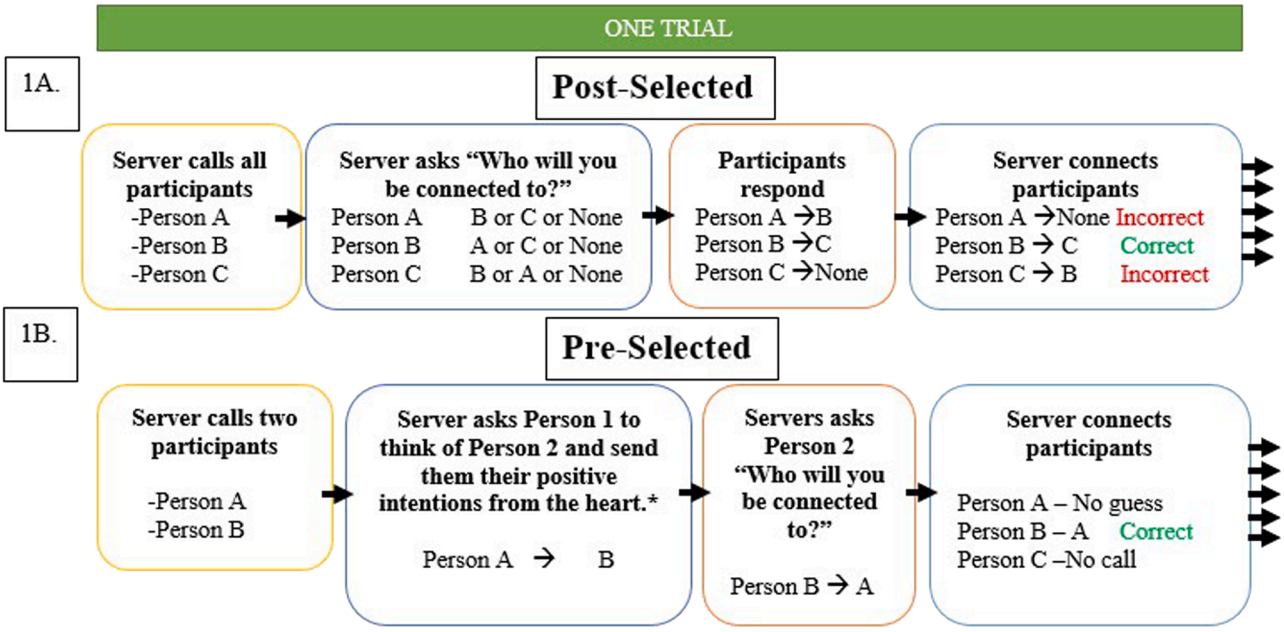

Fig. 1. Randomized study paths.

where three participants are called by the service and asked who they will be connected to. Fig. 1B depicts the telepathic/pre-selected path, where two participants are called. Person A directs their positive intention to Person B. The exact text for this message was, "Please close your eyes and relax. In a moment, you will be connected to [NAME]. Please imagine yourself talking to them. Send your positive intentions from the heart to them." In this instance, the instructions to Person B are exactly the same as for post-selected. Thus, the person does not know there are only two people for that trial, and they have three answer choices for whom they think they will be connected. The randomization program for trial type selection was amended[36] to ensure six completed trials of each type. Prior to this, six triads completed more than six pre-selected trials for a total of 30: two triads completed one extra pre-selected trial, one triad completed four extra pre-selected trials, one triad completed five extra pre-selected trials, and one triad completed eight extra pre-selected trials. These 30 trials were removed from the dataset, and the first six trials of these triads were retained. Please see the pre-registration protocol for details of the randomization schema.[35]

For each trial, the web server called the participants by telephone and gave verbal pre-recorded instructions. Once the web server began the experiment, the web server placed calls randomly throughout the day (during daytime hours from 8 a.m. to 4 p.m. Pacific time) until two trials were completed or five attempts were made each day. The experiment for each triad ended once six completed trials for each path were collected (i.e., 12 trials total) or 120 trial attempts had been made. Triads with less than 12 trials were included in a "completer plus dropout" analysis as described in Statistical Analyses. All responses were stored on an IONS secure web server.

Throughout the course of the study,[36] the following changes were made to the protocol to support recruitment and the participants' successful completion of study activities: 1) changing inclusion/exclusion criteria to include friends (0% genetic relationship); 2) increasing the number of call attempts to the participants from 50 to 100 to 120 call attempts; 3) fixing trial type randomization schema in Twilio program to ensure trial type completion was balanced; and 4) increasing participant compensation for completing the 12 trials (three triads were compensated $60; 9 triads were compensated $80; and 24 triads were compensated $240). The participant task remained the same despite these changes.

Statistical analyses

A power calculation for this study was conducted using the results from a telephone telepathy study with 2080 trials with three callers, 41.8% of which were accurate.[20] We originally planned for 100 triads (n = 300) and used a one-sample proportion binomial test with alpha = 0.05, N = 300, p_0 = 0.33, and p_A = 0.418, which corresponds to 0.88 power with an actual alpha of 0.043. In another study where the callers were familiar with each other, a 53% accuracy rate was observed, and using this anticipated value resulted in 0.98 power for 300 participants (100 triads).[17] However, our actual recruited participant number was lower than our planned number (n = 105 completers, n = 177 all). A "completer" triad was a group that completed 12 trials with 6 of each trial type. "Dropouts" were triads that completed at least one trial on either path but did not complete all trials. We used the effect sizes reported in references Sheldrake, 2015 and Sheldrake & Smart, 2003 and again estimated power post-hoc for our observed sample sizes, finding, respectively, 0.64 and 1.0 power for all participants (n = 177) and 0.45 and 0.99 power for completer participants (i.e., triads that completed 12 trials, six of each trial type; n = 105).

Statistical analyses were conducted using Stata 15.0 (Statacorp, College Station, TX) and MATLAB 2022a (The MathWorks, Inc., Natick, MA). Continuous variables (Age, Education) were evaluated for normality with the Shapiro-Wilk test. Age and Education were not normally distributed. A Kruskal Wallis equality-of-populations rank test was performed to evaluate differences in these variables for completing participants compared to non-completing participants. Categorical variables (Gender, Ethnicity) were evaluated for differences between completing and non-completing participants using the Pearson Chi-Square test.

Research questions

1. Is accuracy greater than what would be expected by chance?

Precognitive/post-selected path - The total number of responses for the post-selected trials was the number of triads x 6 trials x 3 responses/trial. For each of these responses, there were three possible choices (e.g., person A, person B, or no one), meaning that there was a 1 in 3 chance of a correct response, or 33% were expected to be correct. We tested if the

number of correct responses significantly deviated from chance by using the exact binomial test, which evaluates the probability of a given individual answering a number of total trials correctly. We then calculated the 95% Agresti–Coull binomial confidence interval (CI) as recommended for binomial data with an n greater than 40.[38]

Hypothesis: The confirmatory hypothesis was that participants would correctly choose whom, including no one, they would be connected to more often than expected by chance.

We had pre-registered a randomization test for the post-selected path as a planned analysis. This was done because the three responses for one call are not independent as assumed with the binomial model, and the variance for a binomial analysis may not be correct. A randomization test corrects for the dependence. However, since the study outcome was in the opposite direction from what was predicted for a one-sided test (less than 33% rather than greater than 33%), no adjustment to the variance could make the outcome significant, and there was no need to do the test.

Telepathic/pre-selected path - The pre-selected path's total responses were the number of triads x 6 trials x 1 response/triad. Like the post-selected path, there were three possible and 33% expected to be correct by chance, and the exact binomial test and confidence intervals were evaluated as in the post-selected path.

Hypothesis: The confirmatory hypothesis was that participants would correctly choose whom they would be connected to more often than expected by chance.

Randomization test - Data were imported in MATLAB 2022a, and random intenders were selected for each trial (n = 289 completers + dropouts, n = 228 for completers), following the experiment's dependency structure. That is, the random target could be any number between 1 and 3 (since 4 cannot be paired on the phone with someone) and excluding the caller number (e.g., if the caller is Person A, the target could only be Person B or Person C). The proportion of hits was calculated for the whole sample of true data (i.e., 0.5044) and for each simulation (n = 10,000) using the true guesses but with simulated callers. The number of iterations with a hit proportion greater than that from true data was counted across all iterations and divided by the total number of simulations (i.e., 10,000) to obtain the p-value. Additionally, the simulation data, their overall mean hit proportion, and their upper 95% percentile (representing the critical value) were plotted along with the true data hit proportion in addition to the p-value.

Pre versus *Post-selected path* - A repeated measures analysis of variance (ANOVA) was conducted to evaluate the difference in accuracy between the pre- and post-selected paths. The Wald Chi-Squared was used because the accuracy variable is binary. The accuracy variable, as measured by the percentage of correct trials for a given individual, was the dependent measure. The path (i.e., pre- or post-) was the factor variable. The individual was included as a repeated measure variable (i.e., to account for repeated measures of the same person).

Hypothesis: The exploratory hypothesis was that the pre-selected path would result in a greater percentage of correct responses than the post-selected path.

2. What is the relationship between genetic relatedness, emotional closeness, communication frequency, physical distance and accuracy? Multilevel mixed-effects logistic regression was used to estimate and compare three models, predicting accuracy from 1) genetic relatedness, 2) genetic relatedness and trial type, and 3) genetic relatedness, trial type, and covariates - emotional closeness, communication frequency, and physical distance. Accuracy was the dependent binary variable (i.e., correct, not correct). The path was a binary factor variable (i.e., pre- or post-). Genetics was a categorical variable with four levels (i.e., 0%, 12.5%, 25%, and 50%). When included, physical distance, emotional closeness, and communication frequency were continuous covariates from 0 to 100. For trials in which one participant was connected to no one, the genetics variable and three covariates were set at 0. In every model, the participant was included as a random effect.

Hypotheses: There would be a positive correlation between accuracy and genetic relatedness. That is, the more related the two participants were, the more accurate their responses would be. There would also be a positive relationship between emotional closeness and guessing accuracy but no relationship with physical distance or communication frequency.

***Re*-analysis with the inclusion of dropout trials**. Optional stopping refers to situations where researchers examine the data as it is being collected and decide when to stop a study based on the results.[39] The researchers did not examine the data until the data collection period was complete. It can also occur when participants quit the experiment because their accuracy was poor, and they became discouraged. This was addressed by reanalyzing all hypotheses with dropout trials (i.e., including trials for triads who did not complete all 12 trials in addition to those that completed all trials).

Results

Participant recruitment and data collection occurred from December 1, 2021, to August 16, 2022. Participant numbers and characteristics are displayed in Table 1.

Four-hundred and seventy-nine registering participants contacted the research team resulting in 479 potential triads (i.e., the original

Table 1
Participant characteristics.

Characteristic	Completers n = 105		Dropouts n = 72		All n = 177		Statistic (degrees of freedom)
	Mean	*SD*	Mean	*SD*	Mean	*SD*	
Age (years)	48.7	14.6	41.0	15.5	45.5	15.4	*KW* $\chi 2(1)$ = 12.0, P < .001
Education (years)	15.5	2.7	15.7	3.1	15.6	2.9	*KW* $\chi 2(1)$ = 0.004, P = .95
	N	%	*N*	%	*N*	%	
Gender							P $\chi 2(2)$ = 2.2, P = .34
Female	75	71.4	48	66.7	123	69.5	
Male	28	26.7	24	33	52	29.4	
Another gender	2	1.9			2	1.1	
Ethnicity[a]							
Native American	4	3.5	6	7.1	10	5.0	P $\chi 2$ (1) = 1.6, P = .20
Asian	2	1.7	2	2.4	4	2.0	P $\chi 2$ (1) = 0.85, P = .36
African	2	1.7	20	23.5	22	11.0	P $\chi 2(1)$ = 26.3, P < .001
Middle Eastern	7	6.0	5	5.9	12	6.0	P $\chi 2(1)$ = 0.005, P = .94
Latin	14	12.1	12	14.2	26	12.9	P $\chi 2(1)$ = 0.38, P = .54
European	87	75.0	40	47.1	127	63.2	P $\chi 2$ (1) = 15.7, P < .001

[a] Participants could check more than one ethnicity. *SD* – Standard Deviation; *N* – Participant number endorsing that characteristic; KW - Kruskal-Wallis chi-squared statistic; *P* - Pearson chi-squared statistic. Statistics assessing differences in demographics between completers and dropouts were conducted to evaluate if these factors potentially caused differences between completers and dropouts.

registering participant and their two non-registering participants). Of these, 275 triads met inclusion/exclusion criteria and completed the online informed consent process, and 146 triads completed all required information (i.e., contact, demographic, genetic relationship, emotional closeness, communication frequency, and physical distance). Of these, 22 triads were excluded due to incorrect phone numbers, duplicate phone numbers of triad participants, or other issues with the registration data. Another 65 triads were excluded because although they successfully registered, they did not complete any trials. Another 24 triads completed at least one trial on either path but did not complete all trials and are considered "dropouts." A total of 35 triads (105 participants; completers) completed all 12 planned trials, with six trials for each path and are "completers."

Participant characteristics

There were three genetic relatedness ratings (i.e., Person A - Person B; Person A - C; Person B - C) per triad (Table 2). Unrelated (0%) was the most common, followed by 50% (parent or child). No identical or fraternal twins were enrolled in the study despite targeted recruitment. Communication frequency was correlated to emotional closeness (Spearman's *rho* = 0.26, $P < .001$) and physical distance (*rho* = −0.19, $P = .01$). These significant but weak correlations support all three covariates being included in the statistical models.

1 Is accuracy greater than what would be expected by chance?

Precognitive/post-selected - Contrary to our hypothesis, the precognitive/post-selected path results for completers and completers plus dropout trials were not significantly above chance (Table 3).

Telepathic/post-selected - In support of our hypothesis, the telepathic/pre-selected results for completers and including dropout trials, were significantly above chance.

The *p*-values for the telepathic/pre-selected randomization test were $P = .054$ for completers and $P = .02$ for completers plus dropouts (Fig. 2).

Pre versus *post-selected paths* - Repeated measures ANOVA showed that the telepathic/pre-selected path had significantly more correct trials than the precognitive/post-selected path treating participants as a repeated measure (Wald $\chi 2 = 23.0$, $P < .001$), and these results were consistent when dropouts were also included (Wald $\chi 2 = 31.4$, $P < .001$). Average hit rates and standard deviations by participant for the post-selected path were 32.3% (18.3%) for completers and with dropout trials 27.0% (33.3%), and 48.5% (38.9%) for the pre-selected path for completers and 57.1% (43.7%) with dropout trials.

Table 2
Paired participant genetic relatedness and physical distance, emotional closeness, and communication ratings.

Predictor	Completers $n = 105$		Dropouts $n = 72$ *		All $n = 177$*	
	Mean	*SD*	Mean	*SD*	Mean	*SD*
Physical Distance (Miles)	414.6	764.8	305.5	548.6	371.3	687.6
Emotional Closeness (0–100, 100 most close)	76.2	22.5	83.1	21.2	78.9	22.2
Communication Frequency (0–100, 100 most frequent)	59.9	27.2	67.9	33.0	63.1	29.8
	n	%	*n*	%	*n*	%
Genetic Relatedness						
0%	54.0	51.4%	27.0	39.1%	81.0	46.6%
12.5%	2.0	1.9%	10.0	14.5%	12.0	6.9%
25%	4.0	3.8%	2.0	2.9%	6.0	3.4%
50%	45.0	42.9%	30.0	43.5%	75.0	43.1%

* One dropout triad did not enter their relatedness.

Table 3
Accuracy results.

Path	# Responses	Expected% (trials)	Actual% (trials)	Statistics *p*(k≥); 95% CI [ ]; *p*-value
A - Post-selected (3 guesses/trial)*				
Completers	630	33% (210)	32.5% (205)	32.5; [29.0 - 36.3]; 0.61
Including Dropouts	762	33% (254)	31.9% (243)	31.9; [30.1 - 36.8]; 0.75
B - Pre-selected (1 guess/trial)				
Completers	210	33% (70)	48.1% (101)	48.1; [41.4 - 54.8]; <0.001
Including Dropouts	289	33% (96.3)	50.9% (147)	50.9; [45.1 - 56.6]; <0.001

* The callee is blinded to what path they have been randomized to when the server asks them, "Who will you be connected to?" The answer choices for both paths are Person X, Person Y, and No One. Thus, regardless of the path, there are three answer choices and a 33% chance of being correct. The statistics column includes probability from the binomial test, Agresti-Coull confidence interval, and *p*-value.

2 What is the relationship between genetic relatedness, emotional closeness, communication frequency, physical distance and accuracy?

Genetic Relatedness: In the first model, genetics significantly predicted accuracy (Wald $\chi 2 = 20.2$, $P < .001$). Genetic relatedness was a categorical predictor. The beta for the intercept, −0.80, is the log odds for the reference group (0% genetic relatedness). The exponentiated log odds gave the odds ratio of 0.45, corresponding to a probability of successfully identifying the caller as 0.31. Beta is estimated for each level of genetic relatedness, representing the difference in log odds between that level of genetic relatedness and the 0% genetic relatedness. Level differences are reported here in order of descending effect size. Compared to participants with 0% genetic relatedness, the odds of correctly identifying the caller were 3.49 times (249%) higher among participants with 25% genetic relatedness ($\beta = 1.25$, $z = 2.50$, $P = .01$) and 1.86 times (86%) higher among participants with 50% genetic relatedness ($\beta = 0.62$, $z = 3.98$, $P < .001$). The significance, magnitude, and direction of these results were comparable when completed trials from dropouts were included in the model.

Genetics + Trial Type: In the second model, the trial type was added as a predictor. This second model was significant overall (Wald $\chi 2 = 38.6$, $P < .001$). The estimates for genetic relatedness were similar to that of the first model. Compared to 0% genetic relatedness, the odds of accurately identifying the caller were 3.43 times (243%) higher for 25% genetic relatedness ($\beta = 1.23$, $z = 2.44$, $P = .01$) and 1.76 times (76%) higher for 50% relatedness ($\beta = 0.56$, $z = 3.61$, $P < .001$). The trial type variable ($\beta = 0.71$, $z = 4.43$, $P < .001$) was also significant, indicating that the odds of correctly identifying the caller were 2.04 times (104%) higher in the pre-selected than the post-selected path. These results persisted when including dropout trials.

Genetics + Trial Type + Covariates: The third model remained significant when all covariates were included (Wald $\chi 2 = 53.0$, $P < .001$). Compared to 0% genetic relatedness, the odds of accurately identifying the caller was 2.88 times (188%) higher for 25% genetic relatedness ($\beta = 1.06$, $z = 2.10$, $P = .04$), but the other genetic relatedness levels were not significant. In addition, communication frequency was significant ($\beta = 0.006$, $z = 2.19$, $P = .03$) but physical distance ($\beta = 0.0002$, $z = 1.56$, $P = .12$) and emotional closeness ($\beta = 0.005$, $z = 1.87$, $P = .06$) were not. The odds ratio for communication frequency is 1.006, meaning that a 1 unit increase in communication frequency corresponds to a 0.6% increase in accuracy, which is meaningful considering that communication frequency scores ranged from zero to 100. Emotional closeness had

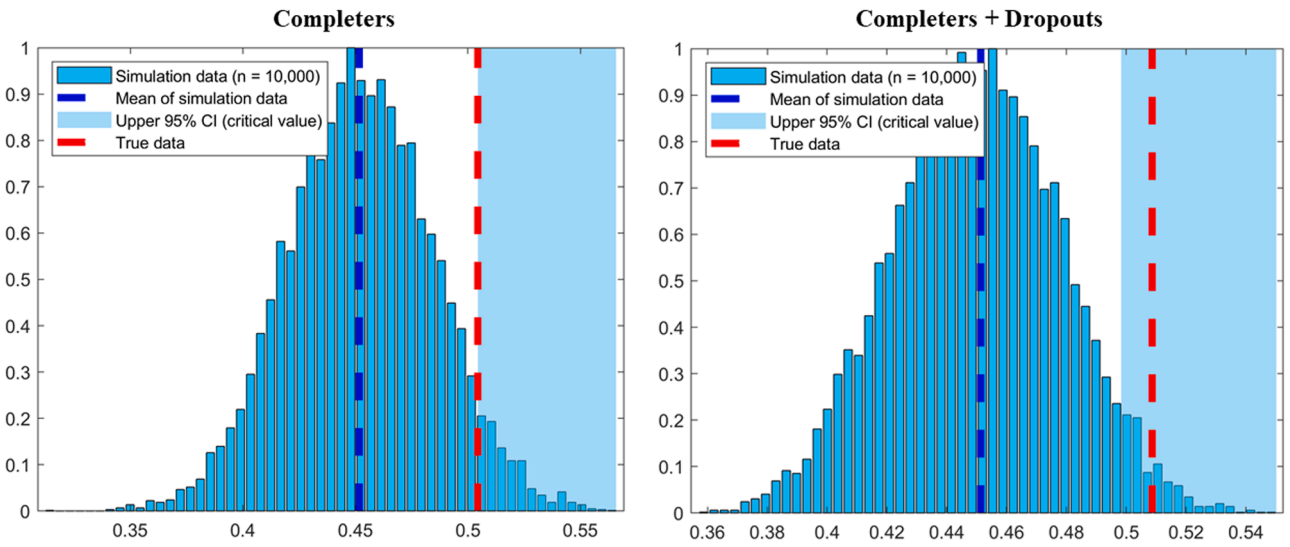

Fig. 2. Histograms show simulation data (10,000 iterations), their mean proportion of successful hits (blue dash line), and the corresponding upper 95% percentile (blue shaded area) representing the critical value (H0, the hypothesis of an absence of a difference can be rejected with 95% confidence). The red dashed line corresponds to the sample's proportion of successful hits. While the value for the *completers'* sample is on the edge of the critical threshold (*p-value* = 0.05), the value for the *completers and dropouts'* sample is above the critical threshold (confirmed by *p-value* = 0.02). X-axis is the proportion of successful hits, and y-axis is the number of observations (corresponding to the proportion of successful hits for the whole sample). Y-axis is scaled to 0–1 for better comparison of true data (1 observation) and simulation data (10,000 observations).

a slightly smaller beta, but that small difference made it non-significant. These results differed when including dropout trials: 25% genetic relatedness shifted the *p*-value down to marginal significance (*p*-value went from 0.036 to 0.062), and communication frequency was more significant (*p*-value went from 0.02 to 0.002).

Discussion

In summary, we found significant positive results when the caller directed their positive intention towards the callee (telepathic/pre-selected; $P < .001$) but not when the callee made their guess before the caller was randomly selected (precognitive/post-selected). This result was consistent in trials contributed by completers and dropouts. As mentioned in the Introduction, the positive result for the telepathic/pre-selected versus precognitive/post-selected paths has been observed in two other studies.[29,30] These results contribute to the literature on telephone telepathy's potential mechanism to be telepathic rather than precognitive. We also observed a relationship between genetic relatedness and accuracy. However, these results were inconsistent when adding covariates to the model and including dropouts. Communication frequency had a significant relationship, with greater frequency being associated with higher accuracy. Perhaps the relationship between genetic relatedness and accuracy is mediated by communication frequency rather than emotional closeness or a biological component. Future mediation analyses are needed to tease apart these nuances.

Our study utilized an automated protocol that addressed the limitations of previous studies of telephone telepathy, such as 1) participants potentially using cold reading techniques or even cheating if not filmed or supervised[17,19–21,24,25] (although videotaped studies have generally reported positive results[18,24,28,40]) and 2) participants inferring the caller based on subtle clues (e.g., number of phone rings). Within most relationships, it can be expected that subtle expectations and other tacit factors exist regarding telephone etiquette. We addressed these potentially confounding factors by implementing a fully automated web-based system that used a PHP pseudo-random generator to determine the connections and how long the phone rang before the connections were made. For the precognitive/post-selected path, this system also prevented cheating by connecting the three participants of each triad simultaneously so that they could not ascertain who they would be connected to using physical means (e.g., even if they were in the same room or had another phone to contact their partners, and they could not tell from the automated system's caller ID number).

However, this study's major limitation is that participants could potentially cheat for the telepathic/pre-selected trials where participants were in the same room, which colors the accuracy results. That is, Person A could potentially tell Person B who was the caller and callee because they knew who they were intending to connect with. In a post-hoc exploratory analysis, we assessed the difference in accuracy by comparing people who lived in the same home (miles = 0) compared to all other physical distance values and found no significant difference in accuracy for people who lived together and those who did not ($\chi 2 = 1.2$, $P = .28$). That is, those that had a higher chance of being in the same room because of their physical proximity did not perform more accurately than those who had a very low chance of being in the same room. Ultimately, video recording the participants for each trial in future studies would provide evidence that cheating did not occur, although this is a logistical difficulty in ecologically valid settings.

Another limitation of this study was the change in protocol required to ensure adequate recruitment and participant completion (i.e., including friends, increasing call attempts, adjusting trial type randomization schema to ensure trial type balance, and participant compensation). Friends, like spouses who were already allowed, corresponded to the 0% genetic relatedness category included in the study. Other researchers have had similar problems in recruiting participants.[20] Considering the taboos around this phenomenon,[41] it is unsurprising that some family members were unwilling and some like-minded friends would be more amenable to participate. Being afraid to approach their family members to participate or their family members being unwilling to participate was another common reason potential volunteers gave for not completing their registration or dropping out. Future recruitment efforts for these study types could use different terms to support interested participants in recruiting their family members (i.e., not include telepathy in recruitment materials). The increased participant compensation and number of attempts to reach the three participants were added to support participants' completion of the study activities. We quickly observed that not all participants were available to answer the call, as reflected in the dropout triads who began the study but failed to complete all 12 trials (although

the accuracy results did not differ when including dropouts' trials). Telephone calls are not as standard in our increasingly fast-paced world, and the increase in robocalls further discourages people from answering the phone. Efforts to conduct paired telepathy experiments using email or text may help deal with this issue, as has been tried by others.[19,21] The change to the trial type randomization schema was done to fix a web server programming issue revealed after the study started and to ensure that triads completed an equal number of trials. These changes did not affect the study tasks, which remained the same throughout the study.

Although the study tasks were identical despite these changes, one reviewer recommended performing per-protocol analyses to evaluate whether the heterogeneous methods affected the outcomes. We repeated the accuracy analyses using homogenous trials collected after the changes detailed above were made. For the precognitive/post-selected trials, there were 135 out of 432 trials accurately guessed for completers (p($k\geq$) 31.3%; 95% CI [27.1 – 35.8]; $p = .31$) and 150 out of 489 accurately guessed including dropouts (p($k\geq$) 30.7%; 95% CI [26.8 – 34.9]; $p = .29$). For the telepathic/pre-selected trials, there were 66 out of 144 trials accurately guessed for completers (p($k\geq$) 45.5; 95% CI [37.9 – 54.0]; $p = .001$) and 82 out of 178 trials accurately guess including dropouts (p($k\geq$) 46.1%; 95% CI [38.9 – 53.3]; $p = .0003$). These per-protocol results do not differ from those found with heterogenous procedure trials and support the idea that the procedural changes did not substantially affect the study results.

Another post-hoc test to evaluate if response bias was at play was to assess how many participants choose 'no one.' Recall that participants had three answer choices, the other two people in their triad and 'no one,' with a theoretical 33% chance to pick those options in both trial types because the person guessing did not know the trial type and always believed they had three choices. We would expect participants to choose 'no one' equally for both trial types, and indeed we observed that this was so. Participants chose 'no one' 98 times (12.8% of 762) for precognitive/post-selected trials and 28 times (9.7% of 289 total) for telepathic/pre-selected trials (Pearson $\chi 2(3) = 5.4$, $P = .15$). However, participants did not choose 'no one' at the expected 33.3% chance level but far below (i.e., 12.8% and 9.7%). This response bias suggests that our original statistical criteria for evaluating the results were not valid. For example, in the extreme situation where participants never chose 'no one,' the probability of guessing correctly would actually be 50%, not 33%. Evaluating the data from this perspective, Table 4 displays the data for completer plus dropout trials where 'no one' was never chosen and when it was. Using a 50% chance expectation for trials where 'no one' was not chosen, 332 (43.6%) and 130.5 (45.1%) correct trials would be expected for the post- and pre-selected path, respectively. Actual values for the precognitive/post-selected path were significantly different from 50% chance expectation (31.9% correct $p(k\geq) = 0.37$; 95% CI [0.34 to 0.42], $P < .001$; and 55.2% incorrect $p(k\geq) = 0.65$; 95% CI [0.61 to 0.69], $P < .001$), suggesting that participants guessed significantly more incorrectly than correctly in the precognitive/post-selected trials. We have no explanation for this surprising post-hoc exploratory finding. By contrast, in the telepathic/pre-selected trials, correct trials where participants chose between two callers were significantly above 50% chance ($P = .02$ by the binomial test; ($p(k\geq) = 0.56$; 95% CI [0.50 to 0.62], $P = .02$). These post-hoc calculations more conservatively assess the accuracy results and support our significant telepathic/pre-selected path findings although further research is required to confirm them.

As for the relationship of physical distance, emotional closeness, and communication frequency with accuracy, the results were mixed and not always aligned with previous research. For example, all callers were known to the participants, unlike other studies where there were familiar and unfamiliar callers.[17,28] We anticipated that the emotional closeness rating would reflect familiarity, but it was not related to accuracy despite other studies finding emotional closeness relevant to accuracy.[17] We found that physical distance was not significant, aligning with other studies' results.[17,22] Communication frequency did have a significant relationship, with participant pairs who communicated more often predicting greater accuracy. As far as we know, this particular variable has not yet been evaluated. Perhaps communication frequency is the driving aspect of other findings of improved accuracy with familiar or emotionally close pairs. These results are preliminary, and future research is necessary to further explore these variables. Similarly, the genetic relatedness results were mixed, and further research is required to evaluate whether genetic relatedness plays a role in telephone telepathy. A first step would be for researchers to collect relatedness data from participants involved in any paired protocol.

Table 4
Data for all trials, including dropout trials.

Path	Total Trials	N = 'No one'	$N \neq$ 'No one'	Correct	Incorrect
Post-Selected Trials	762	98	664	243	421
% of total trials (762)	100%	12.9%	87.1%	31.9%	55.2%
% of trials ≠ 'No one' (664)				36.6%	63.4%
Pre-Selected Trials	289	28	261	147	114
% of total trials (289)	100%	9.7%	90.3%	50.9%	39.4%
% of trials ≠ 'No one' (261)				56.3%	43.7%

The post-hoc analysis data examine the accuracy, excluding trials where 'no one' was not selected. In this case, the chance expectation for accuracy is closer to 50% rather than 33% (i.e., there is one less choice). Total trials is the total number of trials for each path; N = 'No one' is the number of trials in which the answer choice 'no one' was selected. $\boldsymbol{N} \neq$ 'No one' is the number of trials in which the answer choice 'no one' was not selected. Correct is the number of correct trials, and the number of incorrect trials.% of total trials is the percentage of each corresponding trial category from the total number of trials.% of trials ≠ 'No one' is the percentage of each corresponding trial category from the number of trials where participants did not select 'no one.'

In conclusion, we observed significantly above-chance results for telepathy trials, in which the web server pre-selected the callee and the caller was asked to direct their attention toward their partner. This outcome should be considered in light of possible cheating if the participants were in the same room. The variable of communication frequency was also associated with greater accuracy. The influence of emotional closeness and genetic relatedness was uncertain, with our findings adding to mixed results reported on these potential relationships in previous studies. In sum, we believe that further research is warranted to evaluate the telephone telepathy phenomenon.

Author contributions

HW, AD, and DR. made substantial contributions to the conception and study design of the work; AD managed the creation of programming; HW conducted recruitment, data collection, and analysis; HW and CC conducted analyses; HW drafted the initial manuscript and prepared Fig. 1 and the tables; CC prepared supplementary figure; and all authors contributed substantially to final manuscript preparation.

Data availability

The data that support the findings of this study are available in Figshare at http://doi.org/10.6084/m9.figshare.21521235.

Acknowledgments

The authors would like to thank Erin Singer and Laura Dunn for help with participant payments, Rupert Sheldrake, Jim Carpenter, Lisa C. Wilson, Mona Sobhani, Michael Kreigsman for their review of the manuscript, the programmers involved in programming Twilio, and IONS staff and members.

Funding

Bial Foundation Grant No. 108/20.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.explore.2023.08.008.

References

1 Denis G. Personal email communication. Published online October 27, 2022.
2 Sheldrake R. Telepathic telephone calls: two surveys. *J Soc Psych Res*. 2000;64:224–232.
3 Brown DJ, Sheldrake R. The anticipation of telephone calls: a survey in California. *J Parapsychol*. 2001;65:145–156.
4 Myers FWH. *Human Personality and Its Survival of Bodily Death*. University Books; 1903.
5 Wahbeh H, Yount G, Vieten C, Radin D, Delorme A. Measuring extraordinary experiences and beliefs: a validation and reliability study [version 3; peer review: 3 approved]. *F1000Res*. 2020;8(1741):29. https://doi.org/10.12688/f1000research.20409.3.
6 Wahbeh H, Radin D, Mossbridge J, Vieten C, Delorme A. Exceptional experiences reported by scientists and engineers. *EXPLORE J Sci Heal*. 2018;14(5):329–341. https://doi.org/10.1016/j.explore.2018.05.002.
7 Haraldsson E, Houtkooper JM. Psychic experiences in the multinational human values study: who reports them. *J Am Soc Psych Res*. 1991;85(2):145–165.
8 Ipsos M.O.R.I. Three In Five "Believe In God." Ipsos. Published 2003. Accessed October 4, 2022. https://www.ipsos.com/en-uk/three-five-believe-god.
9 Bem DJ. The ganzfeld experiment. *J Parapsychol*. 1993;57(2):101–111.
10 Braud WG, Wood R, Braud LW. Free-response GESP performance during an experimental hypnagogic state induced by visual and acoustic ganzfeld techniques: a replication and extension. *J Am Soc Psych Res*. 1975;69(2):105–113.
11 Bem DJ, Palmer J, Broughton RS. Updating the ganzfeld database: a victim of its own success? *J Parapsychol*. 2001;65:207–218.
12 Tressoldi PE, Storm L. Stage 2 Registered Report: anomalous perception in a Ganzfeld condition-A meta-analysis of more than 40 years investigation. *F1000Res*. 2023;10:234.
13 Baptista J, Derakhshani M, Tressoldi PE. Explicit anomalous cognition: a review of the best evidence in ganzfeld, forced choice, remote viewing and dream studies. In: Cardeña E, Palmer John, Marcusson-Clavertz D, eds. *Parapsychology: A Handbook For the 21st Century*. McFarland & Company, Inc., Publishers; 2015:192–214.
14 Cardeña E. The experimental evidence for parapsychological phenomena: a review. *Am Psychol*. 2018;73(5):663–677. https://doi.org/10.1037/amp0000236.
15 Storm L, Tressoldi PE, Di Risio L. Meta-analysis of free-response studies, 1992–2008: assessing the noise reduction model in parapsychology. *Psychol Bull*. 2010;136(4):471.
16 Storm L, Tressoldi P. Meta-analysis of free-response studies 2009-2018: assessing the noise-reduction model ten years on. *J Soc Psych Res*. 2020;(84):193–219.
17 Sheldrake R, Smart P. Experimental tests for telephone telepathy. *J Soc Psych Res*. 2003;68:184–199.
18 Sheldrake R, Godwin H, Rockell S. A filmed experiment on telephone telepathy with the Nolan Sisters. *J Soc Psych Res*. 2004;68:168–172.
19 Sheldrake R, Avraamides L. An automated test for telepathy in connection with emails. *J Sci Explor*. 2009;23(1):9.
20 Sheldrake R, Smart P, Avraamides L. Automated tests for telephone telepathy using mobile phones. *EXPLORE J Sci Heal*. 2015;11(4):310–319.
21 Sheldrake R, Avraamides L, Novák M. Sensing the sending of SMS messages: an automated test. *EXPLORE J Sci Heal*. 2009;5(5):272–276. https://doi.org/10.1016/j.explore.2009.06.004.
22 Sheldrake R, Beharee A. A rapid online telepathy test. *Psychol Rep*. 2009;104(3):957–970. https://doi.org/10.2466/PR0.104.3.957-970.
23 Sheldrake R, Lambert M. An automated online telepathy test. *J Sci Explor*. 2007;21:511–522.
24 Sheldrake R, Smart P. Videotaped experiments on telephone telepathy. *J Parapsychol*. 2003;67(1):147–166.
25 Sheldrake R, Smart P. Testing for telepathy in connection with e-mails. *Percept Mot Skills*. 2005;101(3):771–786.
26 Schmidt S, Erath D, Ivanova V, Walach H. Do you know who is calling? Experiments on anomalous cognition in phone call receivers. *Open Psychol J*. 2009;2(1). https://doi.org/10.2174/1874350100902010012.
27 Lobach E, Bierman DJ. Who's calling at this hour? Local sidereal time and telephone telepathy. In: *Parapsychological Association Conference Proceedings*. 2004:91–97.
28 Schmidt S, Müller S, Walach H. *Do you know who is on the phone? Replication of an experiment on telephone telepathy*. *Parapsychological Association Conference Proceedings*. 2004:245–254.
29 Sheldrake R. Telepathy in connection with telephone calls, text messages and emails. *J Int Soc Life Inf Sci*. 2014;32(1):7–15. https://doi.org/10.18936/islis.32.1_7.
30 Sheldrake R. The Evolution of Telepathy. Published online February 9, 2011. Accessed October 10, 2022. http://www.dspace.cam.ac.uk/handle/1810/230106.
31 Schmidt S, Muller S, Walach H. Letter to the editor. *J Parapsychol*. 2003;67:409–411.
32 Wahbeh H, Radin D, Yount G, Woodley of Menie MA, Sarraf MA, Karpuj MV. Genetics of psychic ability: a pilot case-control exome sequencing study. *EXPLORE J Sci Heal*. 2022;18(3):71.
33 Cohn SA. Second sight and family history: pedigree and segregation analyses. *J Sci Explor*. 1999;13(3):351–372.
34 Wahbeh H. *KPU_Registry_1062 - A Telephone Telepathy Study: Does Genetic Relatedness Influence Psychic Abilities?* Koestler Parapsychology Unit; 2021. Accessed November 3, 2022 https://www.koestler-parapsychology.psy.ed.ac.uk/Documents/KPU_Registry_1062.pdf.
35 Wahbeh H. *KPU_Registry_1062_2 - A Telephone Telepathy Study: Does Genetic Relatedness Influence Psychic Abilities?* Koestler Parapsychology Unit; 2022. Accessed November 3, 2022 https://www.koestler-parapsychology.psy.ed.ac.uk/Documents/KPU_Registry_1062_2.pdf.
36 Wahbeh H. *KPU_Registry_1062_3 - A Telephone Telepathy Study: Does Genetic Relatedness Influence Psychic Abilities?* Koestler Parapsychology Unit; 2022. Accessed November 3, 2022 https://www.koestler-parapsychology.psy.ed.ac.uk/Documents/KPU_Registry_1062_3.pdf.
37 Wahbeh H. *KPU_Registry_1062_4 - A Telephone Telepathy Study: Does Genetic Relatedness Influence Psychic Abilities?* Koestler Parapsychology Unit; 2022. Accessed November 3, 2022 https://www.koestler-parapsychology.psy.ed.ac.uk/Documents/KPU_Registry_1062_4.pdf.
38 Brown LD, Cai TT, DasGupta A. Interval estimation for a binomial proportion. *Stat Sci*. 2001:101–117. Published online.
39 Rouder JN. Optional stopping: no problem for Bayesians. *Psychon Bull Rev*. 2014;21(2):301–308. https://doi.org/10.3758/s13423-014-0595-4.
40 Harvey C. *Knowing Who Is Calling: Telephones and Mental Telepathy*. Masters Thesis. Eastern Illinois University; 2011.
41 Cardeña E. The unbearable fear of psi: on scientific suppression in the 21st century. *J Sci Explor*. 2015;29(4):601–620.