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Hypothesis

A computer-automated, multi-center, multi-blinded, randomized control trial evaluating hypothesized spirit presence and communication

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A B S T R A C T

The gold standard in biomedical research is the multi-center, multi-blinded, randomized control trial (RCT). In pharmacological research the RCT is termed a Phase III clinical trial. This paper presents the core goals and RCT methods developed to investigate automated spirit presence and communication. The goals are: (1) to use currently available, reliable, and affordable technology (total hardware cost per system less than $4,000; these systems will be provided free to collaborating laboratories), (2) to automate data collection and real-time analyses employing specially designed software, (3) to only require a quiet space (used at night) in collaborating laboratories, (4) to not necessitate human subjects committee approvals at collaborating institutions (because the participants are hypothesized spirit participants), and (5) to enable international collaboration regardless of the investigator's personal beliefs about the hypothesis. The research design and methods meet a phrase popularized by Carl Sagan: "Extraordinary claims require extraordinary evidence." The design minimizes false positives and false negatives. University affiliated investigators in established laboratories who regularly publish in peer reviewed journals, and are interested in collaborating in this RCT, are invited to contact the author.

It doesn't matter how beautiful your theory is, it doesn't matter how smart you are. If it doesn't agree with experiment, it's wrong.
Richard P. Feynman, PhD

Introduction

Few hypotheses are as fundamentally important to science and society as the survival of consciousness after physical death. Obtaining a definitive answer, positive or negative, would have deep significance for humanity.

Converging research from multiple areas, including evidence from (1) near death experiences,[1] (2) reincarnation in adults and children,[2] and (3) multi-blinded mediumship experiments,[3] each point to the plausibility of the survival of consciousness hypothesis. However, none of these research areas, by themselves, are sufficient to draw a firm conclusion; it is the combination / consilience of the evidence that strengthens the conclusion.[4]

A new emerging area of research investigating hypothesized spirit presence and communication using state-of-the-art technology[5,6] provides additional, and potentially definitive evidence, especially when it is integrated with the other areas of survival of consciousness research. It is now possible to conduct multi-centered, multi-blinded, randomized controlled trials (RCTs) testing the spirit presence and communication technology hypothesis. This paper introduces the research and invites established investigators to participate in the RCT research.

Prior computer automated technology experiments

Computer automated proof-of-concept experiments documenting apparent detection of presence of hypothesized spirit participants (HSPs) in the absence of physical experimenters have been reported.[5] The term *spirit* is used here to refer to the hypothesized continued existence of the consciousness and information (and associated energy) after physical death (also termed an entity or discarnate); the term *presence* is used to refer the potential hypothesized localization of the consciousness, information, and energy/spirit of the deceased person (see Schwartz).[5,6]

In two computer automated experiments (exploratory and confirmatory), a research assistant read a standardized script inviting two

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HSPs to come to the laboratory at 11 pm and to follow auditory and visual instructions presented by PowerPoint on a computer monitor. The experimental design involved a pre-experimental baseline period, an HSP presence (in a light tight chamber) period, and a post-experimental baseline period. Each of these periods was 30 min in duration.

Patterns of low-level light were recorded using a Princeton Instruments CCD camera thermoelectrically cooled to − 77 °C. A computer program was written that automated the administration of the instructions and the collection of the long exposure images. In addition, to examine possible false positive effects, no-participant control (sham) night sessions (hereafter referred to simply as control sessions) were run using the identical automated procedures when the HSPs were not invited.[7] Replicated findings consistent with apparent spirit detection were obtained even though no one was physically present when the data were collected.

Given the absence of physical experimenters during the data collection and the inclusion of matched control sessions, the design ruled out (1) experimenter presence, (2) experimenter conscious awareness, and (3) systematic methodological errors[7] as plausible causes of the replicated effects. However, unconscious experimenter intention or retro-causal effects could not be excluded as speculative alternative explanations of the findings.

Unfortunately, highly controlled research of this type has been difficult for other interested investigators to replicate due to practical considerations such as funding for equipment and staff, plus the availability of appropriately skilled research assistants. Recognizing this constraint in advancing the research, the author has developed an automated, no-cost (to collaborating investigators) practical hardware and software system that appears to produce replicable findings under carefully controlled laboratory conditions that minimize both false positive and false negative effects.

What follows is an introduction to an exemplary HSP RCT experiment investigating the spirit presence and communication technology hypothesis. I will outline a binary cognitive task (a version of "I'm Not a Robot" test) that meets essential criteria for conducting tightly controlled RCTs on hypothesized spirit presence and communication. Then I will describe the recording hardware and associated automation software that makes conducting this research practical.

To help the reader understand the methods, I include a brief description of some exemplary proof-of-concept findings employing the technology. A separate scientific report thoroughly presenting the findings (including formal descriptions of the statistical analyses, effect sizes, power analyses, etc.), is in preparation.

To help the reader understand the similarities and differences between drug RCTs and HSP RCTs, I provide a brief comparison of the two. I also include a discussion of how the design minimizes both false positive and false negative findings.

Comparing drug RCTs with HSP RCTs – similarities and differences

In a conventional drug RCT study, one (or more) drugs are compared to placebo controls. This is the primary independent variable. Using hypertension as an example, one or more purported antihypertensive drugs are administered to patients under conditions where (1) the patients are not informed whether they are receiving the hypothesized active medication or placebo pills, and (2) the physicians or nurses who are administering the pills do not know which patients are receiving the medications and which are receiving the placebos. Hence, both the patients and providers are blinded (i.e. double-blinded).

The selection of which patients receive the medications or placebos is determined randomly by experimenters (the keepers of the secret codes) who (1) are not providers, and (2) do not interact with the patients. Also, specific criteria are determined for selecting patients appropriate for the trial as well as the persons who are administering the pills.

The primary dependent variable is typically the standardized measurement of blood pressures. Multiple measurements are taken before, during, and after the drug trial to adequately quantify the effectiveness of the medications in lowering blood pressure. The measurements may (or may not) be taken by the providers. If the measurements are made by research assistants, then the research assistants are also kept blind to whether a given patient has received a medication or placebo.

In drug RCTs, the identical criteria for selecting patients and providers are used across the centers, and the identical protocols are used for measuring and quantifying changes in blood pressure. However, by necessity, different patients, providers and research assistants are employed across the collaborating centers.

An HSP RCT shares certain similarities, as well as important differences, with a drug RCT.

There are six primary similarities between HSP and drug RCTs:

1. One (or more) HSPs serve as the hypothesized independent variable (s) in HSP RCTs.
2. Just as the individual centers in drug RCTs do not create the standardized pills (the pills are provided by the principle investigator of the drug RCT), the individual centers in HSP RCTs do not create the HSPs (i.e. the specific HSPs are provided by the principle investigator of the HSP RCT).
3. Key HPS RCT personnel are blind to whether the HSPs are present or not for a given protocol of measurements. The HSP absent sessions serve as matched placebo controls (sham sessions).
4. The presence or absence of the HSPs is determined randomly by specific experimenters who are keepers of the secret codes.
5. The dependent measurement protocol must be sensitive and reliable for quantifying the predicted effects.
6. Conventional power analyses and statistics are used.

However, there are at least six differences between drug and HSP RCTs that are unique to an HSP RCT, and especially a completely computer automated HSP RCT:

1. There are no patients receiving medications or placebos in HSP RCTs. There are only measurement protocols used to detect the purported presence of the HSP (s) compared to no-treatment, matched control sessions of measurements.
2. Since no patients are required in HSP RCTs, there are no issues concerning patient recruitment within and across centers.
3. Since there are no patients, there is no need for "providers."
4. Using a completely computer automated measurement protocol, it becomes possible in HSP RCTs to keep everyone associated with a given center blind to the presence or absence of the HSPs. Moreover, by collecting the measurements at night, when no one is physically present in the laboratory room housing the equipment, this can insure complete blinding (at least in terms of consciousness awareness) of the researchers and staff in the centers. It is also possible to employ two test stations (clearly designated as 1 and 2) at a given center, and on a given evening have the HSPs generate data only on one of them (the other serving as the matched placebo control).
5. In order for the purported HSP(s) to know whether to go to a given center on a given night (or generate data using either test station 1 or 2 on a given night), carefully selected and validated research mediums are employed as the "experimenters" who follow the secret randomized codes. Their task is to instruct the collaborating HSP(s), nightly, as to when and where to go (or which test station to use). To maximize multiple blinding conditions, even the principle investigator is kept blind to the actual HSPs schedules (e.g. by employing a separate person who creates the secret codes and then distributes them to the various experimenter mediums).

6. Because the core research question involves the hypothesized existence of HSPs who are conscious, intelligent, volunteer participants, the systematic measurement protocol involves the careful design of tasks that require conscious cognitive information processing in order to successfully perform the tasks.

Appreciating these similarities and differences, we can now consider an exemplary task that addresses the core HSP hypothesis.

The "I'm Not a Robot" (INR) Task

A well-known online technique used to distinguish between an intelligent person and a web-based program mimicking a person is the "I'm Not a Robot" (INR) task. An INR task is commonly found, for example, as part of a logon procedure for online banking. Another term for INR is CAPTCHA (i.e. a "completely automated public Turing test to tell computers and humans apart").

In the INR task, a person may be shown a scene broken into a 4×4 (or larger) grid of squares, each containing a photograph. The instructions might be "Select all the squares with cars." The person's task would be to click all the individual squares that included at least a part of an automobile, and not click the other squares.

This task requires that the person (1) understands the instructions, (2) is motivated to follow the instructions, (3) can use a mouse to select a given square, and (4) can discern which squares contain parts of a car and which do not. It is the last step that enables the web server to judge whether the selections are being made intentionally by an intelligent person, or by an artificial intelligence (AI) "robot" attempting to masquerade as a living person. It is anticipated that future advanced AI systems will be able to accomplish INR tasks; currently the INR task is an effective way to determine if the user of a web page is an intentional, intelligent person.

In the present experiment, we modified the INR task to fit a binary (yes / no) context. Imagine that you are shown images that contain either a part of a vehicle (e.g. the door of a car, the wings of an airplane, the side of boat), or a part of an animal (e.g. the beak of a bird, the neck of a giraffe, or the horns of a goat). You are given the instruction, "Is this image a vehicle? If yes, please place your hands on either side of the box in front of you. If the image does not contain a part of a vehicle, keep your hands in your lap."

Four sample images are shown in Fig. 1 below:

Imagine that the test consists of twelve different images of vehicles and twelve different images of animals, presented one at a time in a

Fig. 1. Four sample images, two contain a vehicle, and two contain an animal.

counterbalanced ABBABAAB order. If (1) you understand the instructions, (2) you are motivated to pass the test, (3) you can make the requested physical response, and (4) you can discern which squares contain parts of a vehicle (images 1 and 4 in Fig. 1) and which do not, then (5) you will be able to establish that you are not a robot. Though this task clearly (and purposely) requires focused attention to perform it correctly, it is relatively easy for an educated person to perform accurately.

Now, imagine that this exact task is repeated, only this time (1) the person invited to perform the task is an HSP, (2) the specific response requested of the HSP is automatically detected by the hardware and software test station, and (3) the task is run in the middle of the night when no physical experimenters are present.

If the evidence collected in such an experiment indicated that the task was performed accurately (especially when compared to matched control sessions when HSPs were not invited to perform the task), the logic would suggest that an intentional, intelligent presence – in this instance, an HSP – had participated in the experiment and successfully performed the cognitive task.

With the addition of appropriate security measures, the experimental design can rule out fraud, chance, uncontrolled physical variables, etc. Therefore, the only remaining currently envisioned explanation other than "super psi" speculations (i.e., extremely effective, unconscious psychokinetic or precognitive abilities on the part of the experimenters), is intentional and intelligent HSP activity.

It is important to understand that a binary (yes / no) response paradigm can be employed for multiple types of tests, including:

Type I: Response Skills Tests, e.g. to determine if a given HSP can reliably make a specified yes or no response when requested.

Type II: Cognitive Understanding Tests, e.g. our adaptation of the INR test).

Type III: Personal Authentication Tests, e.g. to determine if a given HSP can reliably identify himself or herself when presented with specific information such as names of parents and siblings, birth dates and birth places, occupations, dates and causes of death that fit or do not fit a given HSP.

Type IV: Advanced Knowledge Tests, e.g. to determine if a given HSP is an expert physicist by providing specific formulas which are correct versus incorrect.

If all four kinds of tests are employed, and if the evidence from all four tests is positive, the consilience of the evidence points to the probable voluntary participation / presence of specific HSPs engaged in complex cognitive and communication tasks. Moreover, successfully performance in Type III (personal identification) and Type IV (advanced knowledge) tasks together reduce the probability that the results could be achieved by a potential "imposter."

Practical recording hardware

Thanks to the development of the following hardware and software, it is now possible to run large scale multi-center, multi-blinded, randomized control trials to investigate these four types of tests (skills, understanding, identification, knowledge). Five core requirements were deemed essential for an ideal / practical hardware test station. They include:

(1) readily available,
(2) sufficiently sensitive and stable,
(3) relatively low cost,
(4) amenable to computer automation, and
(5) capable of producing statistically reliable results in terms of detecting the apparent presence and actions of HSPs.

A simple hardware system that meets these five requirements involves the use of (1) an HD quality webcam to record the dynamics of light produced in a plasma globe (explained below), (2) a computer to automate the collection and analysis of the resulting video images,

(3) a light-tight enclosure to house the webcam and globe, and (4) a secondary monitor to present the instruction to the HSPs.

In our research we have used industrial quality video cameras (https://www.jai.com/) as well as relatively inexpensive Logitech webcams (e.g. HD Pro C920s). It turns out that the latter are sufficiently stabile and accurate to obtain reliable results for quantifying plasma globe dynamics.

Contemporary plasma globes are based on technology originally developed and patented by Nicola Tesla in 1881 (U.S. Patent No. 454,622) and developed into an artistic novelty item in the 1970′s by Bill Parker, a student at MIT. Plasma globes (also called plasma balls and lamps) are spheres filled with a mixture of noble gasses. The gasses are excited by a relatively high-frequency alternating current (e.g. 35k Hz, compared to the 60 Hz line power supply) at 2–5k volts (i.e. compared to 110 Vs). Placing a fingertip directly on the glass creates an attractive spot for free electrons to flow. This is because the conductive human body is more easily polarized than the dielectric material around the electrode (i.e. the gas within the globe), which in turn provides an alternative discharge path having less resistance.

This "touching the globe" plasma streaming effect can be easily seen by the naked eye. The plasma globe to be used in the RCT is an AC powered Lebbeen Glass 5-inch plasma globe available from Amazon.com.

If a conductive object does *not* make direct contact with the globe, the dynamics of the plasma streams will still change, but these *subtle changes* will *not* typically be apparent to the naked eye (e.g. shown in Fig. 3 below). However, using image averaging techniques, it becomes possible to quantify these effects via the mean of multiple camera shots as well as other statistical methods (e.g. Fig. 4 below).

We reasoned that if (1) HSPs interacted with a plasma globe under controlled and replicated conditions, and that (2) HSPs had some sort of physical or quasi-physical presence, then (3) it might be possible using image averaging techniques to detect HSPs interactions with the plasma globe, and therefore (4) potentially employ a single globe as a sort of binary switch.

A subset of evidential research mediums report that they experience seeing specific HSPs in three-dimensional space. Moreover, the HSPs they see not only have a recognizable anatomical (human) form, but they appear to move their arms and legs volitionally. Hundreds of hours of pilot experimentation with the collaboration of a skilled evidential research medium indicates that motivated HSPs can follow instructions and interact with the plasma globe using their apparent energy hands. Moreover, close analysis reveals that their effects on the plasma dynamics often match the effects observed with people physically interacting with the globes, albeit at much smaller magnitudes of effect (e.g. 0.1 to 1%).

Our working hypothesis is that HSPs consist of dynamically organized, historical, quantum and electromagnetic systems / bodies, and that like physical persons, they attract electrons in a plasma globe, albeit at much smaller magnitudes (since their electrical resistance is predicted to be substantially higher than physical persons). The reason for employing multiple HSPs is to establish the replicability of this hypothesis across HSPs.

A PC laptop with an Intel i7 processor, 16 gigabytes of ram, and a 1 terabyte hard drive, is sufficiently powerful to run the automated experiment and perform the image analyses. The complete system includes a high-quality black interior storage container (Bigso Black Woodgrain Storage Box, 15″ x 2″ 11–3/8″ h). This enclosure creates a light tight environment for a Logitech Pro-C920s HD webcam mounted on a sturdy miniature tripod (UBeesize Desktop Tripod, Tabletop Mini), plus the Lebbeen brand plasma globe. It also includes a secondary HD monitor for displaying information to the participants. The computer is connected to high speed wi-fi and controlled remotely with TeamViewer and SplashTop software.

A version of the system using a slightly larger Bristol Storage Box is shown in Fig. 2:

Fig. 2. The left image shows the enclosure housing the 5-inch plasma globe and JIA industrial camera, with a computer monitor on top for HSPs to view instructions. To reveal the plasma globe and video camera, in the right image the monitor was removed, and the enclosure was tilted up and temporarily rested on its back.

The automation software

With the collaboration of an optical sciences computer programmer and an optical camera specialist, the author has developed a general-purpose software system dubbed AQUA (Automated Query and Analysis). AQUA makes it possible to completely automate data collection and analysis, not only in terms of presenting experimental conditions, but in performing real time image processing and summary graphs as well. One version of the software runs high-end video cameras (AQUA-G), the other runs selected webcams (AQUA-W). Both versions of AQUA can be run in parallel with additional sensor data logging systems (e.g. www.vernier.com). This makes it possible to measure temperature, humidity, and background sound levels during both HSP and NPC / sham control sessions across laboratories. Though the AQUA system is currently designed for binary tasks, it can be expanded to accommodate multiple-choice tests.

A partial list of AQUA's fully automated features include:

1. Collecting baseline (pre) and response (yes or no) periods per trial (e.g. "is this a vehicle?").
2. Presenting prerecorded audio instructions using Verbose text to speech software for the baseline and response periods per trial
   a. At the start of a baseline period, a standard aural instruction is: "This is a baseline. Please sit still with your hands in your lap."
   b. At the start of a response period, depending upon the type of task, the instruction might be, "Are you ready? Here is the question. Is this a vehicle? Please answer yes or no."
3. Presenting visual slides for the baseline and response periods.
4. Varying the number, duration, and order of the baseline and response periods.
5. Varying the number of video frames collected per baseline and response periods.
6. Calculating averaged (mean) images and standard deviation images per period per trial.
7. Calculating response minus baseline delta images, separately for yes and no response trials, and then displaying incremental averaged images for yes-delta minus no-delta (i.e. delta-delta) images.
8. At the end of the experiment, displaying multiple summary averaged means and standard deviations delta and delta-delta images.
9. Calculating values for specific "regions of interest" (ROIs) within the images, for subsequent statistical analyses across sessions, and also displaying them as bar or line graphs.

The entire sequence is established through an extensive configuration file, and the sequence can be initiated remotely. The summary averaged images, as well as the ROI Excel files, are then uploaded via wi-fi to the cloud for secure storage and subsequent within and between center statistical analyses.

In our experiments, we have determined empirically that 10 s duration trial lengths for baseline and response periods, each period containing 300 images (at 30 images per second), and repeated for 20 – 24 trials, are enough to produce replicable averaged findings across sessions. To control for unwanted sequential / trial order effects, we use an ABBABAAB counterbalanced order design. Moreover, to test for possible systematic methodological error and false positive effects, we include matched no participant control (sham) sessions.

The data presented in Fig. 3 are based on findings with a physical person. The figure displays sample individual images (top row) and averages of 300 images (bottom row), separately for hands placed 1 inch from either side of the enclosure (but not touching the box – left two columns) versus hands in lap (right two columns). Both baseline (i.e. pre-question) and response (i.e. post-question) periods are shown. To the naked eye, there are no obvious patterns that distinguish the response conditions.

However, when the pre-question averaged (baseline) images are subtracted from their respective post-question (response) averaged images, previously hidden underlying patterns are revealed (Fig. 4). These "delta" image patterns can be quantified by carefully selecting appropriate regions of interest (ROIs) within the overall averaged images and displaying those averaged pixels in terms of plot profiles. ROIs have been determined empirically in exploratory research, based on examination of HSP and control sessions observed in real time. The validated ROIs are then automatically calculated and displayed by AQUA.

Sample delta images created with AQUA software (from Fig. 3) as well as plot profiles using ImageJ image processing software (available from https://imagej.nih.gov/ij/) are shown in Fig. 4. The relative brightness is set at the same scale for both images via ImageJ. ImageJ has also been used to verify the automated calculations performed by the AQUA software system.

Not only is the delta image for the hands on either side of the box trial (left) in Fig. 4 clearly brighter in certain regions as measured by illumination in vertical slices (e.g. plasma streams emanating from the sides of the inner ball) than the hands in lap trial (right), but the plot profile reveals a brighter "plume" reaching upward from the inner ball (the round object, which is the excitation electrode in the center of the globe) as well.

Computer automation as well as individual case, live demonstrations

Following an extensive period of exploratory, unpublished research developing AQUA methods and procedures, six controlled experiments (three using an 8-inch plasma globe, and three with a 5-inch globe) were performed with various combinations of HSPs. One experiment (Experiment 2) was conducted with Faraday shielding. As mentioned above, a formal scientific paper presenting this evidence in detail is in preparation. An outline of Experiments 1–3 and experiments 5–6 is provided below. A more detailed (but still abbreviated) presentation of image plus numeric data from Experiment 4 are included for illustrative purposes. All significant effects mentioned below for Experiments 1–6 were at least $p < 0.05$, two tailed.

Because AQUA is a general purpose, computer automation video processing software system, it can be applied to numerous areas in basic and applied science. When AQUA is specifically employed with a plasma globe, its possible applications include the measurement of human biophysical effects in health and healing. However, this article is focused on the spirit communication hypothesis and the running of HSP RCTs.

Because an additional important goal has been to develop a real time (live) demonstration system that can potentially be used to reveal the presence of individual HSPs in a single session, *this purpose has required that research be able to obtain replicated / significant findings using small numbers of participants.* The small sample size, live demonstration, *applied science* HSP goal compliments the large sample size, HSP RCT, *basic science* goal of conducting coordinated, replicated international experiments.

Experiment 1: Twelve different HSPs, 1 session per HSP, were invited by a female medium to participate in a 20 trial (10 yes and 10 no) Type I, Response Skills test. During the data collection period, neither the medium nor the experimenter (the author) were physically present. The plasma globe enclosure was a conventional unshielded box. Sixteen no participant control (NPC) sessions were also conducted.

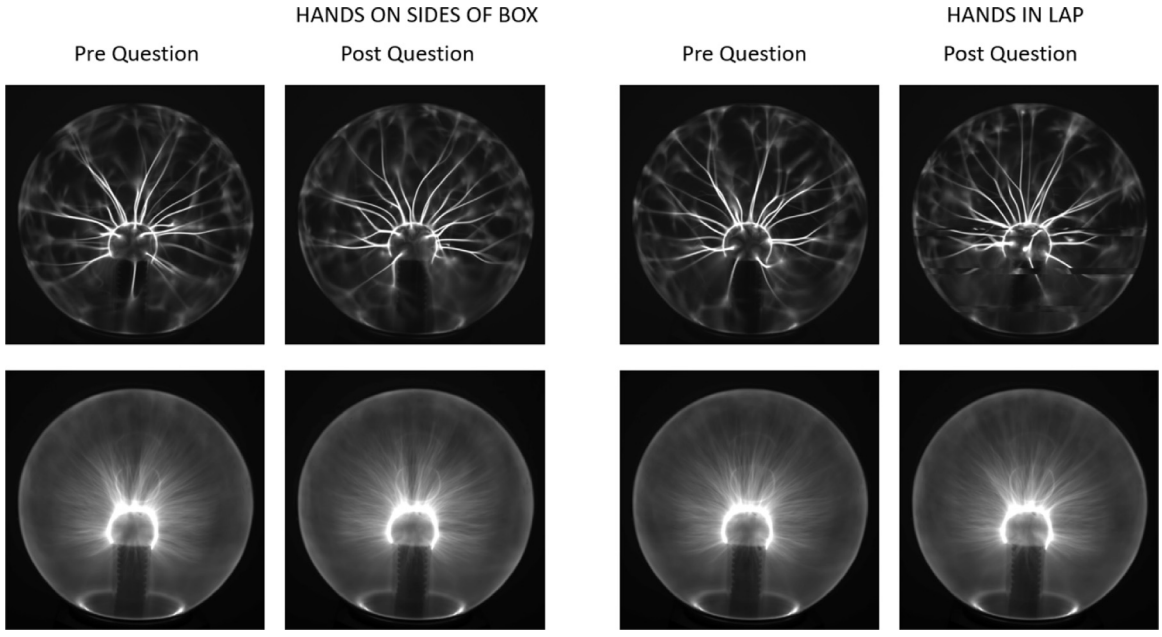

Fig. 3. The top row shows individual images, the bottom row shows averages of 300 images, for baseline (i.e. pre-question) and response (i.e. post-question) periods. The left two columns are for a single 10 s trial for hands placed on either side of (but not touching) the box (left two columns), versus hands kept in lap (right two columns).

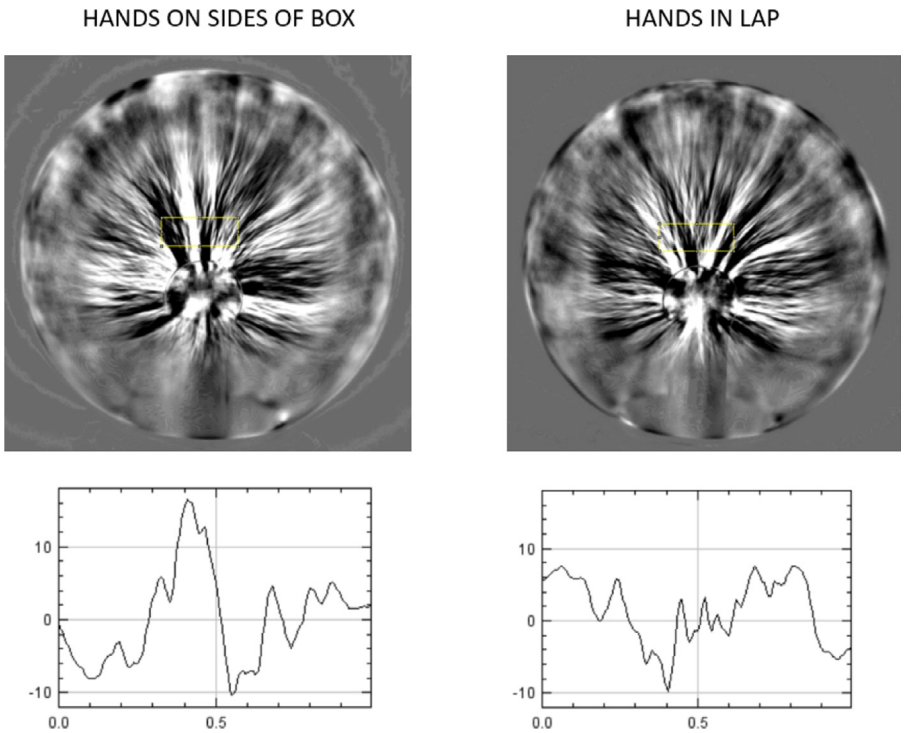

Fig. 4. Hands on sides of box minus baseline delta image shown on the left, hands in lap minus baseline delta image shown on the right. The bottom plot profile graphs are calculated from rectangular ROIs above the balls inside the globes.

Statistically significant effects in designated ROIs were found for the HSP sessions but not in the NPC sessions.

Experiment 2: Two different HSPs (18 sessions per HSP) were invited by a male research assistant who was not a medium but was perceived to be an acceptable experimenter according to the medium in Experiment 1. The research assistant replicated the 20 trial (10 Yes and 10 no) Type 1, Response Skills test. The medium and experimenter for Experiment 1 were blind to the precise times and orders of the sessions. During data collection, the research assistant was not physically present. The plasma globe was housed in a Faraday-shielded, temperature-stabilized, sound-attenuated room. The HSP results for Experiment 1 were successfully replicated with the research assistant.

Experiment 3: Four different HSPs (2 sessions per HSP) were invited in by the medium using a 24 trial (12 yes and 12 no) Type II, Cognitive Understanding test (an INR task). Both the medium and experimenter were present for the first 4 sessions and absent for the second 4 sessions. The plasma globe enclosure was a conventional unshielded box. Eight matched NPC sessions were run. Significant effects in designated ROIs were again found for the HSP sessions but not in the NPC sessions. Moreover, comparable HSP effects were found when the medium and experimenter were present (sessions 1–4) and absent (sessions 5–8).

Experiment 4: To determine if the above findings obtained with an 8-inch globe could be replicated in a 5-inch globe, in Experiment 4 the same HSPs from Experiment 3 were requested to perform the identical INR test with the medium and experimenter present. Also, 4 matched NPC sessions were run. Finally, the medium herself completed one session (i.e. placing her hands on either side of the box but not touching it) for a "Yes this is a vehicle" task. This experiment is described in more detail below.

Fig. 5 displays the summary "delta-delta" – i.e. (yes minus baseline) minus (no minus baseline) – separately for the medium (left image), the HSPs (center image), and the controls (right image). The relative brightness was set to the same scale for these three images, making intensity comparisons across the three delta-delta images possible.

It is immediately apparent that as would be expected, the delta-delta image with the physical experimenter (left) is clearly brighter than the other two images (HSPs and No Participants Controls),

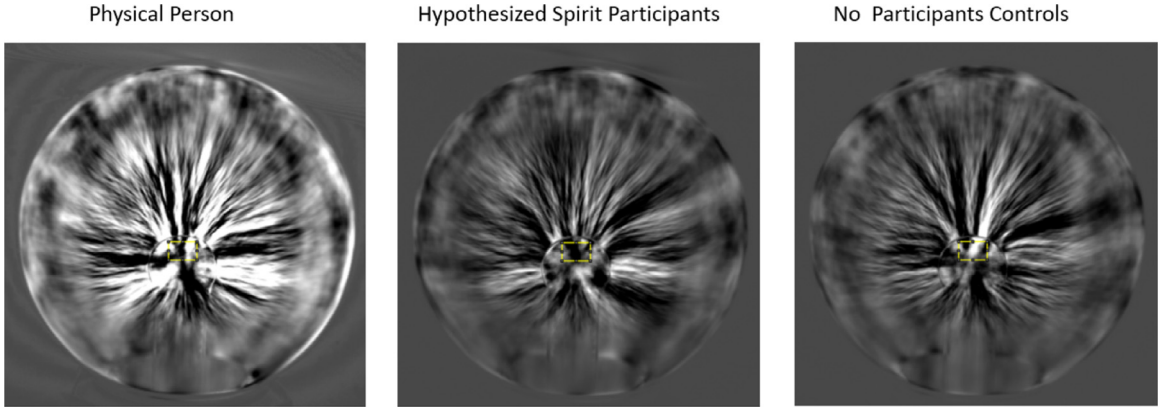

Fig. 5. Delta-Delta summary images for a physical person (left), hypothesized spirit participants (center), and no participant controls (right). See text for details.

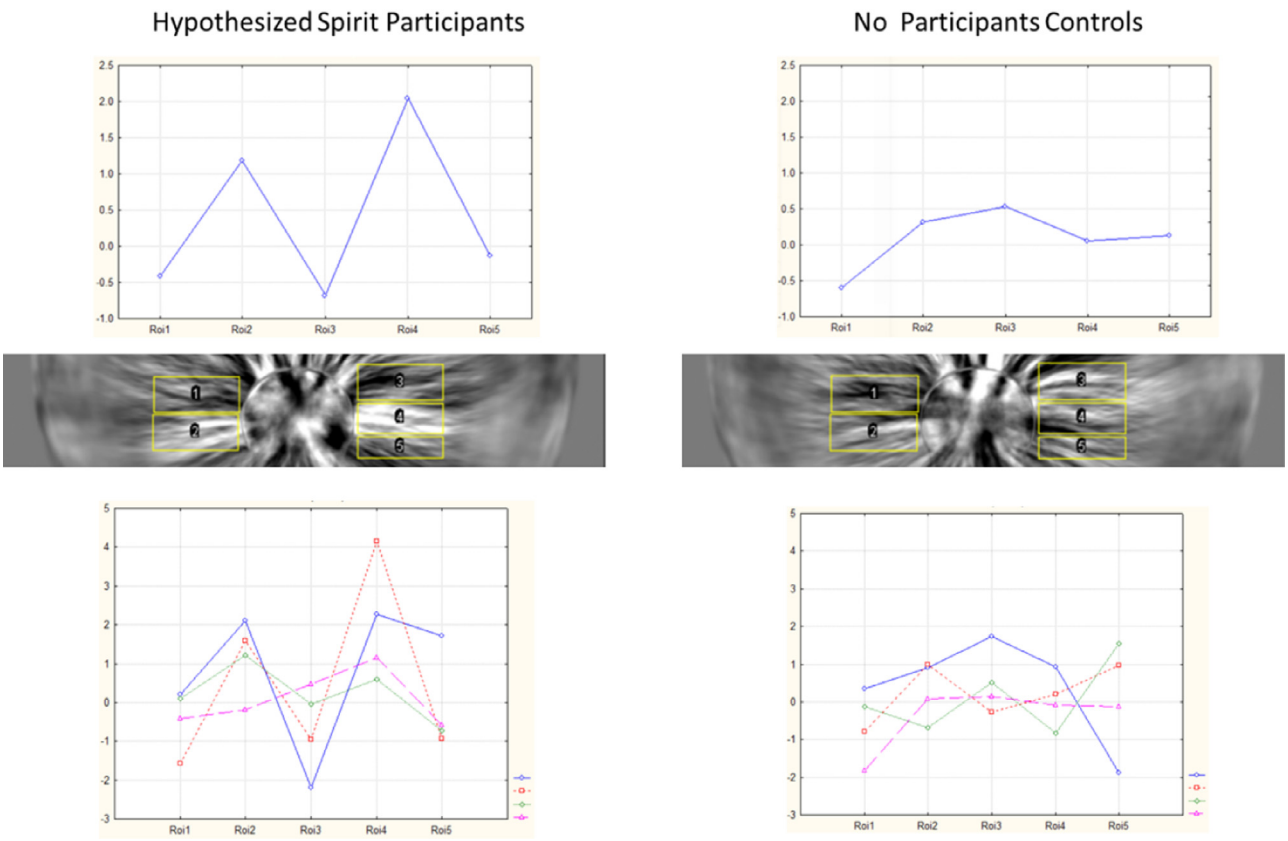

Fig. 6. Averaged as well as individual ROI profiles of averaged brightness patterns comparing 5 horizontal ROIs near the inner ball.

especially near the inner ball, both horizontal and vertical above the ball. In addition, it is also apparent that the summary HSP delta-delta image (middle) shows a somewhat similar structure to the physical person delta-delta image (left), especially near the ball, when both are compared to the summary control image (right).

Recalling our complimentary goal for live demonstrations and its requirement for our being able to document small sample-size effects, Fig. 6 displays averaged as well as individual ROI profiles of averaged brightness patterns comparing 5 horizontal ROIs near the inner ball. The brightness levels are rescaled for easier visualization. The full delta-delta globe images are shown in Fig. 7.

Repeated measures analyses of variance confirm what the averaged and individual graphs in Fig. 6 reveal; the averaged profile of these ROIs is significant ($p < 0.05$) for the HSPs but not for the NPCs ($p < 0.70$).

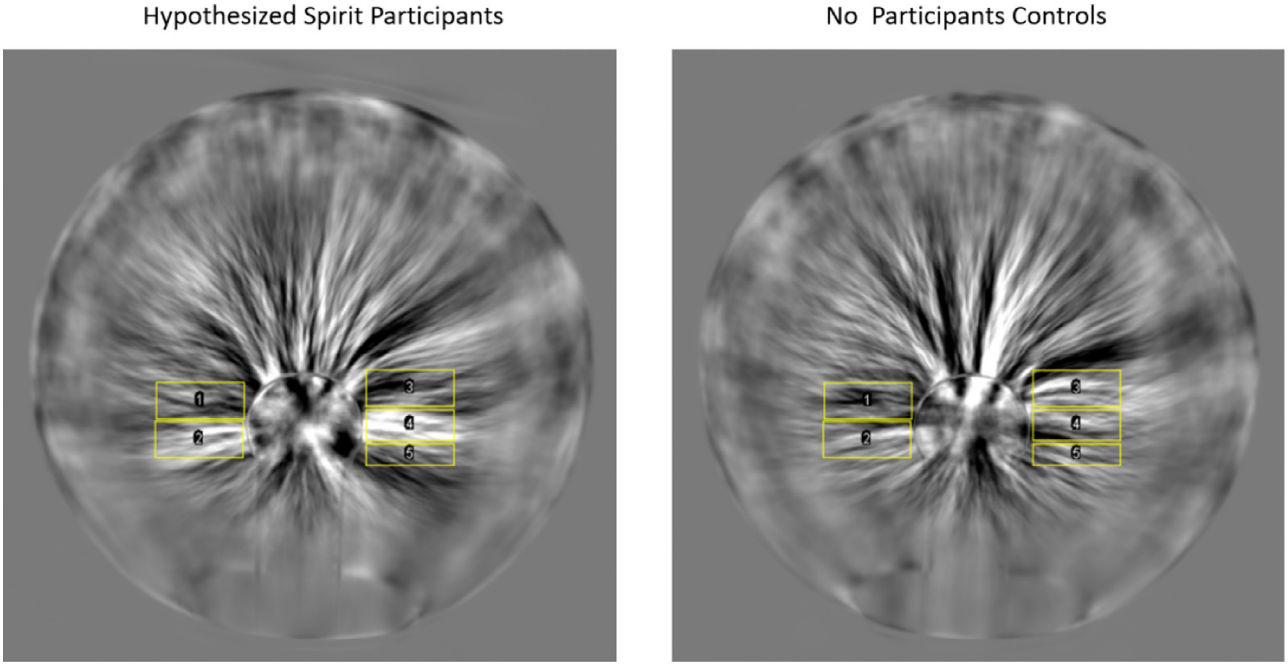

Fig. 7. Full delta-delta globe images with the 5 ROIs for HSPs (left) and controls (right).

Experiments 5 + 6: Four different HSPs (20 sessions per HSP per experiment) were invited in by a research assistant who is not a medium, using a 24 trial (12 yes and 12 no) Type II, Cognitive Understanding test (an INR task). The choice of experimenter replicated and extended the original computer automated experiments published in 2011 which also used a research assistant who was not a medium. The research assistant was not present during the data collection. The plasma globe enclosure was a conventional unshielded box. Eighty matched NPC sessions were run per experiment. This resulted in a total of 160 HSP sessions and 160 NPC sessions over the two experiments. Again, significant effects in designated ROIs were found for the HSP sessions separately for Experiments 5 and 6, but not in their matched NPC sessions.

Minimizing false positive and false negative findings

Typically, skeptics are concerned with minimizing false positive findings, while believers are concerned with minimizing false negative findings. *However, optimal research should minimize the potential for false positives and false negative findings.*

In this HSP RCT, potential false positive findings are minimized in the following ways:

1. Everyone associated with the research is blinded to critical details. For example, only the medium experimenters will know which HSPs are visiting which centers (or using which test station) on a given night. Since multiple medium experimenters will participate in the RCT, and they will have different randomized schedules of HSPs visiting (or not visiting) specific centers (or using which test station), no single experimenter will know the complete research schedule. Only after all the data has been collected for the entire RCT will the secret codes be broken, and the data made available for analysis.
2. The INR task is not only completely automated (e.g. so no physical people are present during the recording sessions), but the order of the YES and NO response trials is completely counterbalanced (ruling out possible order effects in producing the results).
3. Moreover, when X laboratories are collecting HSP sessions, Y laboratories are collecting NPC sessions. Therefore, uncontrollable variables like weather, background noise, etc., will not produce systematic methodological errors when comparing YES and NO trials in HSP versus NPC sessions.
4. The data will be recorded and stored using a sophisticated fraud verification system (e.g. if any summary data file is tampered with after the data has been collected, the altered file can be detected). Critical summary files are immediately copied and stored in secured cloud accounts. Since all the computers will be identical and provided by the principle investigator, the security procedures will be standardized across centers. These security procedures also minimize the possibility of an unethical person attempting to sabatoge the experiments and produce false negative findings.

Potential false negative findings are minimized in the following ways:

1. All of the procedures – including the complete INR task, the plasma globe measurements and analyses, the selected HPSs, and the selected medium experimenters, have been extensively evaluated in multiple previous experiments.
2. For the INR task, the number of YES and NO trials (24 total), the lengths of the recording periods (10 s), the number of images recorded per period (300), etc., have all been tested and determined to be empirically sufficient to obtain replicable results.
3. All of the medium experimenters have met the following five criteria:
   a. they have successfully participated in previous blinded mediumship research in the laboratory,
   b. they have given multiple presentations at professional meetings in their field,
   c. they have published well written books for the general public on mediumship and related topics,
   d. they evidence high professional and ethical standards, and
   e. they report having positive experiences with the HSPs.
4. Finally, all the HPSs have been identified as purportedly participating in the ongoing research by evidential research mediums.

This combination of factors increases the likelihood that strong conclusions, positive or negative, can be reached following the completion of this research.

Invitation to participate in this First-of-Its-Kind HSP RCT

As stated previously, the two complimentary goals for the experimental design are to:

Goal 1: To create sensitive experimental conditions that will *optimize replication* of the emerging findings (e.g. using experienced research mediums as well as research tested HSPs provided by the RCT), and thereby minimize false negative findings, and at the same time

Goal 2: To employ *appropriate control conditions* (e.g. for blinding within and between laboratories) as well as *safeguards for the integrity of the research* (e.g. to remove the possibility, or the appearance, of fraud), thereby minimizing false positives.

To achieve these two complimentary goals, this HSP RCT:

1. Uses currently available, reliable, and affordable technology (total hardware cost per system less than $4000; the systems will be provided free to collaborating laboratories);
2. Uses completely automated data collection and real-time analyses with provided software;
3. Requires a quiet space used at night, with only minimal personnel time required by a research assistant;
4. Does not necessitate obtaining human subjects committee approvals at collaborating institutions because the participants are hypothetical (i.e., HSPs); and
5. Enables international collaboration regardless of the investigators' prior beliefs about the possibility of HSP presence and communication.

Following Richard Feynman's quote that introduces this article, the purpose of this research is either to (1) provide extraordinary evidence documenting the extraordinary claim of apparent spirit presence and communication, or (2) provide compelling absence of evidence that questions the veracity of this controversial hypothesis. Because absence of evidence is not evidence of absence, what can make a negative result compelling is when it has been independently performed sensitively, fairly, and responsibly, with a sufficiently large sample size.

Skeptical readers might wonder whether HSPs, if they exist, would choose to participate in research that includes skeptical experimenters. When evidential mediums are asked to inquire about this important issue, they report that the specific HSPs carefully selected for this research are not concerned about investigators' beliefs. Thus, these mediums predict that positive effects will be obtained regardless of the beliefs of the investigators.

The bottom line is that using the complete set of methods described herein, it is now possible to collect HSP RCT data in a completely automated manner, and reach a firm scientific conclusion, one way or the other.

Established investigators who (1) have previously published their work in peer reviewed scientific journals, (2) have university affiliations, (3) are associated with an established laboratory, and (4) are interested in collaborating in this research, are invited to contact the lab manager, Jennifer Horner, at hornerj@email.arizona.edu.

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