Further Possible Physiological Connectedness Between Identical Twins: The London Study

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Four pairs of monozygotic twins were tested for synchronous responses that occurred in the physiological data of one twin during the period when the other twin was exposed to shock and surprise stimuli. Each of the five stimuli was presented in random order, producing five blocks of trial periods within each 25-minute session per twin. There were eight possible trial periods within each block. The choice of the trial periods, that is, the exact time placement of the shock stimuli within the blocks, was determined randomly. Data from six sessions with the four pairs of twins were used by the same polygraph expert who was successful in a previous study in identifying these trial periods. In accordance with the previously determined protocol for the experiment, six of these trials were passed on, leaving 24 trial blocks for which assessments were made as to which period the stimulus had occurred. Six of these gave hits, whereas three hits were expected by chance and four of these six correct placements were made by one of the pairs of twins. The data provide further justification for a major study in this area using the outlined methodology with selected pairs of twins.

Key words: entanglement, monozygotic twins, telepathy, parapsychology

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INTRODUCTION

In a previous report, a presentation was given of the methodology and the results of the testing of twins who claimed to have exceptional experiences of connectedness such as telepathic experiences and synchronous physiological experiences.[1] We refer to this study henceforth as the Copenhagen study, and the current study is an attempt to apply the same basic design to a new sample of monozygotic twins, this time in a London location. Because of difficulties in raising funds for studies of this unusual nature, both Copenhagen and London studies were pilot studies supported by the resources of television companies that filmed and later broadcasted the sessions.

The choice of monozygotic (identical) twins had been made because the authors of previous surveys before to the Copenhagen study had found that monozygotic twins report these exceptional experiences significantly more often than dizygotic twins.[2,3] A follow-up survey of this population found that the most frequent experiences that occurred among the monozygotic twins concerned accidents, shared dreams, and even positive events.[4] Although the surveys indicated that approximately 60% of twins reported telepathy-like experiences, only approximately one-tenth reported these experiences on a regular basis. It was partly for this reason that the Exceptional Experiences Questionnaire (EEQ) was developed and given to twins taking part in the Twin Day organized by the Department of Twin Research in 2009 at King's College, University of London, located at St Thomas' Hospital in London.[3] This provided us with a sample of more than 200 responses from which to select the pairs of twins used in the current (London) study.

As reviewed in the report from the Copenhagen study, there have been a dozen or so attempts to study these experiences in a laboratory environment.[1] Although some of the results appeared confirmatory, virtually all the experiments had major shortcomings such as the failure to select twins claiming to be psychic, failing to adjust for multiple-analysis of data, and the use of various complicated methodologies.[5] This was a conclusion that motivated the contemporary pilot work aimed at developing a standard methodological design that would be easily applicable.

The Copenhagen study was conducted with the logistic and financial support of Danish Television, which enabled the selection of four pairs of identical twins from a population of 50 pairs obtained through advertising for twins with psychic experiences. The present (London) study was set up when about 9 months later, a similar opportunity occurred, as far as we can tell completely independently and without previous knowledge of the Danish program, with financing and logistical support this time being provided by the American Broadcasting Company (ie, ABC News). This enabled us to test four more twins with a procedure that was very similar to that used in the Copenhagen study but used a different method of evaluating the results.

The design here was similar to the one in the Copenhagen study in the respect that one twin was exposed successively to one of five randomly chosen shock or surprise stimuli while the other twin was located in a distant room and being psychophysiologically monitored. The monitoring was in the form of a polygraph recording, which included electrodermal activity, pulse rate, blood pressure, movement responses, and breathing (pulmonary and diaphragmatic). The polygraph expert, who was of course blinded as to the exposure time, then had the task of

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using the data to identify the correct windows of stimulus exposure. Because we did not have the access in this study to the atomic clocks used in the Copenhagen (which were filmed and gave therefore accuracy when comparing timing between the two rooms), the window for a hit was a wider one. It was defined as ±15 seconds from the stimulus presentation (in the Copenhagen experiment the window was −5/+10 s from the precise time of the actual stimulus presentation).

Although the overall results of the Copenhagen study were nonsignificant, one individual twin session (of the six that were usable) did give significant results, with the expert correctly identifying three of the five windows for the five shocks/surprises. A second independent expert made eight judgments confirming among these three hits, which was highly statistically significant, and suggested that the measures used here have reliability.

This session belonged to a pair of twins who were the only ones in the sample having an embryonic history designated as monochorionic-monoamnionic, that is, sharing the same placenta and amnion cavity. It has been speculated on theoretic grounds that twins who belong to a more "entangled system" may have more potential connectedness of this sort.[6,7]

The present study was set up with the recruiting and testing facilities provided by the Department of Twin Research at London University's King's College, located in St Thomas' Hospital. As in the previous study, the protocol for the running of the experiment, including the definition of a hit, was recorded in advance and sent to ABC News. The method of statistical analysis also was agreed on and written into the protocol. We were able to use in this London study, the same polygraph expert Terry Mullins, who made the main judgments in the Copenhagen study.

METHODS

As in the previous study, the support facilities enabled us to test four pairs of twins in alternating roles of receiving random shocks/surprise stimuli and being physiologically monitored. (Although we choose to see this in terms of synchronous reactions, the roles correspond to the traditional ones of sender and receiver).

The testing of four twins in these roles gave a total of eight experimental sessions. Some departures from the original Copenhagen design were incorporated because of the different testing environment and to explore an alternative method of evaluation. The procedure and method had to be adapted somewhat from the Copenhagen study to meet the ethical standards of the Department of Twin Research and of ABC News.

Participants

The pairs of twins were selected by Göran Brusewitz on the basis of the subjective psi (psychic) and synchronous experiences reported in their responses to EEQ. The selection criteria using the EEQ were the reporting of (1) frequent and diverse telepathic experiences and (2) physiological synchronistic experiences with the other twin.

Ten pairs of twins from the original testing pool of 224 of participants who had filled in the EEQ were deemed of sufficient interest to be invited to the sessions and were then contacted via e-mail by Teresa Matthews of ABC News (which reimbursed the subjects' traveling expenses). However, only four pairs of twins of those initially contacted were available for the experimental days. All four pairs were females between the ages of 25 and 65.

Unfortunately, despite the rather extensive data collection at the Department of Twin Research, it is apparently very rare that any data are recorded concerning of the specific type of twin birth. No such data appeared to exist in the cases of the current participants.

Methods

Although the London and the Copenhagen studies share the same basic design as regards the testing, there is a difference is that in the Copenhagen study allowed in principle a *free choice* in attempting to identify the positions of the five stimulus presentation windows throughout the whole 15-minute session. To be counted as a "hit," the hit window had to be located at or within −5 and +10 seconds from the precise time of the actual stimulus presentation. The polygraph expert was allowed to make 10 estimates but was required then to rank these in order of deviance from a normal resting record. The major criterion for deviance was a large unaccountable change in the electrodermal response, but other criteria such as unexpected deviations in pulse rate and movement also were taken into account. The Copenhagen study carried out a reliability check made independently by another polygraph expert on the significant judgments made there and found these to achieve a good level of consensus.[1]

In the London set-up, we used 5-minute blocks within which to place each one of the five stimuli. The duration of the exposure period (ie, the period in which a trial took place) was determined to be 30 seconds. It was decided to reserve a half-minute both in the beginning and at the end of the session block for establishing a psychophysiological baseline. This left an allocation of 4 minutes within each time block for the exposures to take place, thereby providing us with eight potential exposure periods per block, each of 30 seconds' duration. With the two extra half minutes at the beginning and end of the session included, this provided 5 minutes per block and 5 stimulus exposures and a session lasting 25 minutes. The order and actual placement of the specific stimulus within the 5-minute periods were decided by random means (by use of the random number program given at: http://www.randomizer.org/). For instance, in Figure 1, it can be seen that the ice exposure was randomly selected as the second of the five stimuli and randomly placed to occur at 8.15 with an error window of 8.00 and 8.30 minutes.

This meant that we could then use a *forced-choice method* for the expert judge to attempt to locate the stimulus window within predefined blocks. With the 25-minute session divided into five blocks each of 5-minute duration, the task was to use the polygraph data to find the five exposure trial periods within each of the five blocks (Table 1).). The order of the five stimuli used in the session was determined by use of the random number program given at: http://www.randomizer.org/.

Within each of the five blocks, there were eight possible randomized placements, each of 30 seconds. duration. This means that each stimulus presentation has a one in eight chance (P = .125) of the polygraph expert, making a hit of making a correct

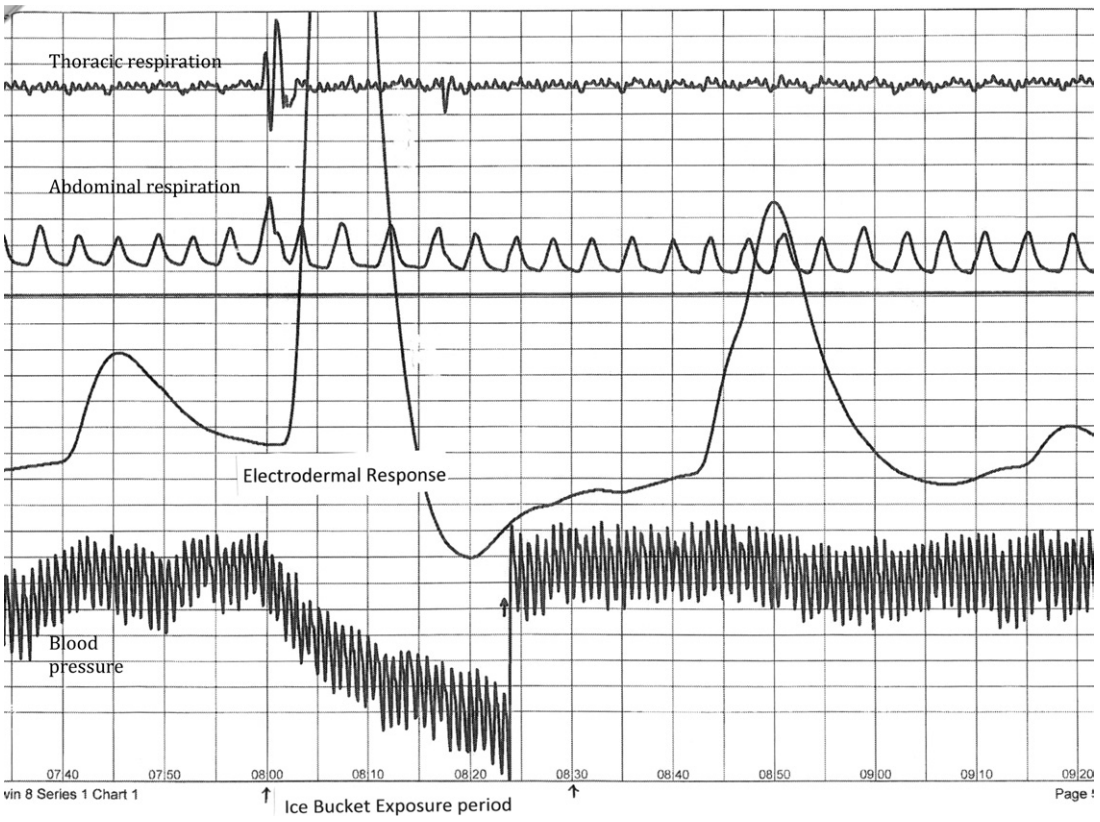

Figure 1. The physiological recording for the part of the session 4B showing the apparent response to the ice bucket. The electrodermal channel recording shows a major deflection at a point in time closely in correspondence with the ice bucket being placed on her twin's arm. Noteworthy are also the same clear breaks in the breathing rhythm (called admens) depicted in the two top curves for pulmonary and thoracic breathing rhythms resp. These admens are apparently unusual for a person who is relaxing. They also were observed in and described in the Copenhagen experiment.

identification of the exposure period. Given there are five exposures, the probability of two hits becomes 2/64, reaching the 0.03 level. This enables each individual to be statistically assessed for her or his ability.

The stimulus was presented at the 15-second midpoint of the 30-second section that had been randomly chosen (to avoid clumping of stimuli, giving in the worst case a minimum of 1 minute between exposures).

The aforementioned time allocation meant there was a total of 25 minutes per twin and because 10 minutes were added for the twins to exchange testing roles, approximately 60 minutes were needed for testing each per twin pair.

One further difference between the two studies was that the investigators in the Copenhagen study had access to atomic clocks placed in both testing rooms and under the view of the recording cameras. This was not a feature of the London

Table 1. Showing the random choice of one of the 8 possible windows within the block for each of the 5 shock exposures.

	Windows for the exposure placements							
Shock Stimulus	30 sec. Potential exposure period 1	30 sec. Potential exposure period 2	30 sec. Potential exposure period 3	30 sec. Potential exposure Period 4	30 sec. Potential exposure period 5	30 sec. Potential exposure period 6	30 sec. Potential exposure period 7	30 sec. Potential exposure period 8
1								
2								
3								
4								
5								

experiment, and we had to rely on the timing-stop clock program of the iPhone. Although initially this was manually synchronized with the polygraph reader's mobile, the synchronized timing was only approximate because of the time delay in both rooms involved in responding to the short message signal (SMS), marking this on the record and applying the stimulus.

Applied Stimuli

The principle was to use stimuli that could elicit some of the basic emotions (fear, joy, surprise), but we had difficulty in finding an appropriate positive stimulus. The five stimuli chosen included the two most successful stimuli used in the Copenhagen experiment: placing the subject's arm into an ice container, and the sound of porcelain plates crashing onto the floor. Both studies also included the sound of bursting balloons. Because of ethical considerations, the mild electric shock stimulus used in the Copenhagen experiment had to be substituted by a heat appliance that could be turned off by the recipient at the experience of pain. The remaining stimulus was the eliciting of a knee reflex* (instead of the jack-in-the-box used by the Copenhagen group).

Procedure

With the aforementioned exceptions, the same basic procedure was used here as had been used in the Copenhagen experiment. Testing was performed in rooms allocated to the Department of Twin Research. After an initial introduction and interviews were complete, one twin was placed in the monitoring room and the physiological monitoring equipment was attached. The same testing expert (Terry Mullins) who was involved in the Copenhagen experiment was involved in this study. The same equipment and recording channels also were used: a Lafayette LX4000 polygraph (Lafayette Instrument Co., Lafayette, IN) with Lafayette's authorized software, which was used to measure heart rate, blood pressure, galvanic skin response, breathing rate, and movement responses.

The other twin (designated henceforth as twin 2) was placed in a reclining chair in the testing room, located 32.5 m ($\pm$1 m) from the center of the other room and separated by intervening rooms, closed doors, and two corridors with doors. Twin 2 received relaxation instructions from the main experimenter (Adrian Parker), who then retired in to the adjoining console to select the stimulus. The start of the experiment was the word "Start" signaled as an SMS sent with via mobile phone to the polygraph expert, who marked this start time onto the recording chart of physiological activity. This one-way communication was, in principle, the only communication allowed between the two rooms during the sessions. In practice, it proved impossible to stop television personnel and camera teams from occasionally wandering between rooms, but they remained largely unobtrusive and were silent during the trials.

Each twin pair required approximately 1 hour for testing as well as some time for the introduction to the procedure. This enabled two pairs of twins to be tested in a half day. The interviews were conducted in the mornings, and two pairs of the twins were tested in the afternoons of the 2 days. Testing was carried on 2 days (May 24 and 25, 2011) with cameras always in use, one focused on each of the twins.

The five stimuli were randomly chosen as to their order and time of presentation by use of the random number program given at: http://www.randomizer.org/ with access being gained to the Internet via an iPhone (access to the Internet services of the Department of Twin Research was unavailable).

Throughout the 25-minute exposure session, while blind to the exposure trials, the polygraph expert recorded the electrodermal response, movement, breathing, and blood pressure that occurred in twin 2, located in the distant room.

Before the final analysis of the results, all forms of communication should have been excluded between the assessor (polygraph expert), who accompanied the receiver twin, and the experimenter who accompanied the sender. In practice, because of delays in the interviews and coordination of the release of the participants for testing, this was not always possible. Nevertheless, such brief exchanges that unavoidably occurred were of course barred from any discussion of the previous experimental sessions.

RESULTS

Four pairs of twins were tested, and the eight sessions relating to them are designated 1 to 4 with the A and B added to referring to the twin being physiologically monitored. The first session with twin 1A unfortunately had to be registered as a mistrial. After the experimenter A.P. had sent the "start" SMS, the twin (designated 1A) who was being monitored decided she needed to visit the toilet, and A.P. did not see the return SMS from the monitoring room indicating this delay. (The protocol only allowed the start signal and no other communication was expected.) Accordingly, no attempt was made at identifying the exposure periods for session 1A. A further session, that of 3B, had to be declared a mistrial because the monitored twin had apparently fallen asleep during the procedure. It was also allowed as part of the protocol for the expert assessor to pass on specific exposure trials if he deemed it difficult or impossible to identify any remarkable deviations in the physiological record of the monitored twin. There were six such passes: 1B trials 2 and 3 and 2B trial 5 and 4A trial 2; and 4B trials 1 and 3. Therefore, of a possible 30 valid trial exposures, 24 trials could be assessed according to the protocol.

An initial difficulty did occur in this evaluation because of the expert assessor inadvertently following the former procedure used in the Copenhagen study of giving several ranked values for a session in the manner. Because this was not part of the present protocol for the experiment, we addressed this by strictly following the procedure of only taking the "window" or timing that had received the top ranking for each of the trial exposure periods. Rankings other than the top were therefore never considered.

*Originally falling backwards into the reclining chair had been included but was withdrawn after one trial because of risk considerations given the age of some of the participants. On one trial occasion, trial 4 for session 4B, the ice bucket had to be substituted for the heat shock because this was unexpectedly unavailable at the time of the trial.

Because there were 24 periods under review and a one in eight chance of correctly identifying each, then three correct placements would be expected by chance. The result gave a total of six correct placements of the window. This was thus double this expected value and theoretically, and on a binomial test is marginally significant ($P = .07$, one-tailed). Although the study is extremely small-scale, this result in such a small sample has the importance of justifying a replication with much larger sample or further trials with the same selected participants.

However, what is most interesting are the results of the last twin pair who were tested because four of the six correct placements came from these twins. These four correct placements were obtained in the seven trial periods that could be evaluated by the expert (he passed on the remaining three trial periods). It is probably not meaningful to carry out statistical tests on such small numbers, but theoretically less than one correct placement would be expected by chance and such results if they occurred on a large scale would happen once in a hundred. An example is given in Figure 1 of the type of record showing clearly a deviation for the electrodermal response, which appeared to be synchronous with the immersion of the foot in an ice container of the other twin.

DISCUSSION

This pilot study continued the development of objective methods for examining possible anomalous physiological connectedness between physically isolated pairs of subjects, which we began in a previous study.[1] Monozygotic twins were recruited because they report greater frequencies of such experiences in surveys.[2,3] The results of testing were of marginal statistical significance, but the outstanding performance of one of four pairs of identical twins is cause for further interest. Moreover, this is a similar result to that found in the Copenhagen study, in which one member of the four pairs of twins gave statistically significant results and suggests that after strict screening with interviews and questionnaires, some identical twins could show significant signs of connectedness.

The main difference in design between the London and the Copenhagen study was the task of the polygraph expert. In the Copenhagen study, the expert analyzed the whole 15-minute session and was asked to point to a specific second when an anomalous physiological pattern began, if any. He was not forced to focus in on specific periods to search for deviations in responses but simply was asked to rank any he found on a 0-10 scale. This *free choice* method gave very precise estimates, and the exact proximity between stimuli and physiological deviations could be objectively documented by filmed atomic clocks.

In the London study, we used the forced-choice method and a longer definition of a hit-window (30s vs 15 seconds in the Copenhagen study). For larger studies, the statistical method in the Copenhagen study also may yield difficulties in the overall analyses: because one of the functions in the formula cannot be calculated for numbers greater than 170 on most mathematical software, this may then be relevant when having, for instance, 20 sessions with 10 potential hit windows.

The Copenhagen study included some methodological advantages. A reliability check, which was not undertaken here, was made on the significant session by an independent expert confirming the significance of these results. The Copenhagen study used atomic clocks filmed by cameras in all testing rooms. The London experiment relied on the timing-stop clock program of the iPhone so the timing there can only be viewed as approximate because of the potential time delay in sending and receiving a text message and the marking of this on the monitoring computer.

Another caveat in the London study concerns the elimination of sensory communication. The distance between the rooms was approximately 33 m with intervening rooms, and although camera crews entered the rooms, the doors were closed during the sessions. It can be maintained that subliminal auditory cues from the stimulus room might have reached the physiologically monitored twin. Earphones or earplugs would reduce this possibility. What speaks against this as an explanation here is that most of the hits (4 of 6) were caused by the almost silent stimulus, that is, the ice container. Concerning the choice of stimuli, the ice bucket was also among the most successful stimuli (together with the plates and the electric pen) in the Copenhagen study. In both studies, we found a large GSR increase and anomalous breathing rhythms in the nonstimulated twin during application of the ice bucket. In general, the studies suggest that the stronger startle stimuli are preferable to the weaker ones.

The pair of twins who produced most of the hits in this series was the youngest in the sample (25 years), and one of them was 7 months pregnant. In the interview, the nonpregnant twin told how they had led independent lives but her belief in twin telepathy had suddenly increased because of her remarkable sensitivity to her twin sister's state during pregnancy. (The presence of the pregnant twin was unplanned for. Although the stimuli were in reality more of a surprise rather than true shock, we informed the twins of the nature of the stimuli and received their explicit wish and formal agreement to continue).

The London and Copenhagen studies were exploratory pilot studies, and nothing can be said in terms of so-called "proof-based evidence" for anomalous physiological connectedness between identical twins. However, the results are consistent with previous findings, suggesting that among identical twins reporting these exceptional experiences to a high degree, about one in four may apparently give significant results. These findings should be followed up in larger and more controlled studies of selected twins with detailed case notes.

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