COGNITIVE AND PHYSIOLOGICAL PSI RESPONSES TO REMOTE POSITIVE AND NEUTRAL EMOTIONAL STATES [1]

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Abstract

Cognitive and physiological psi responses to positive, happy memories and emotionally neutral thoughts were examined. Thirty-two agent/percipient pairs each participated in one session. Each session had 64 30-second periods, with 16 positive and 16 neutral emotional sending periods pseudo-randomly interspersed with 32 rest periods. Electrodermal activity (EDA) was measured for all periods, and conscious responses obtained for the first or second half of each session. Percipients showed significantly greater EDA activation during positive emotional periods, than during neutral ($df = 32$, $t = -1.77$, $p = 0.043$). There was no significant psi-scoring in the conscious response measure, nor any significant differences between the two sending conditions. Exploratory analyses examining interactions between the two psi measures showed highly significant EDA psi-scoring in the first half of each session during which conscious responses were also elicited ($df = 15$, $t = -4.14$, $p < 0.001$, two-tailed), but not from the other combinations of conditions. Implications of these findings are discussed.

Introduction

It is frequently argued that psi is largely an unconscious process (e.g., Schouten, 1976). Various physiological responses have been used to measure psi activity without recourse to conscious measures (see Beloff, 1974; Morris, 1977; and Palmer, 1978 for reviews). The recent work of William Braud and his colleagues has clearly demonstrated the effectiveness of electrodermal activity (EDA) as an indicator of psi interaction (Braud & Schlitz, 1991).

Researchers have commented upon the potential advantages and disadvantages of physiological measures of psi as opposed to conscious measures (e.g., Schouten, 1976; Morris, 1977). Physiological responses, primarily involving EEG measurements, have met with some success as predictors of conscious psi measures (see above reviews). However, the authors know only three studies in which both conscious and unconscious (physiological) responses were used as the actual psi measures, namely Tart (1963), Dean (1974) and Targ & Puthoff (1974). Tart obtained significant, positive psi scoring with EEG and plethysmograph measures, but not EDA. Targ and Puthoff found significant psi scoring with the EEG measure. In both of these studies the conscious response measure failed to reach significance. However, Dean reported success with both an REM measure and a free-response (dream recall) measure.

Since the above physiological measures are closely linked with emotional arousal, another area of interest is the emotionality of targets. The spontaneous case literature provides considerable support for the efficacy of highly emotive targets, as do many anecdotal

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comments in the experimental literature (Delanoy, 1989). However, a review of published experiments specifically examing the use of emotional and non-emotional targets, did not clearly establish the superiority of emotional targets (Delanoy, 1989). An unpublished undergraduate psychology project supervised by the first author, DD, further explored the use of emotional targets (Boswell, 1993). Using a conscious response measure, Boswell found significant overall psi-hitting, significant scoring for the sending of positive emotions and nearly significant scoring for neutral emotions, with negative emotions eliciting scoring very near MCE. Rating scale data showed significant correlations between the agent's degree of involvement in sending the emotion and psi scoring, overall and in all three emotional conditions. An overall correlation between the degree of the percipients' confidence and their psi scoring was not significant, but there were significant positive correlations for both the positive and negative emotional conditions. These findings suggest that positive emotions may be better targets than negative emotions, but are not vastly superior to neutral ones. The correlations between psi-hitting and the degree of the agents' involvement supports the benefit of having agents who are highly engrossed in their task.

In the present study, emotionally positive and neutral agent states constitute the target stimulus. A positive/neutral comparison is made rather than a negative/neutral or a negative/positive because: a) other findings indicate that negative emotions are less likely to produce psi-hitting than neutral or positive emotions in the conscious response measure (Johnson, 1971; Johnson and Nordbeck, 1972; Williams and Duke, 1980; and, Boswell, 1993); b) agents might not wish to experience a negative emotion, or to transmit it to a friend, who could be similarly less open to receiving such; c) as positive and negative emotions could be equally arousing, they may not produce differential EDA responses in the percipient; and, d) the findings from Braud and his colleagues' EDA research (Braud & Schlitz, 1991) could be interpreted as suggesting that differential EDA responses may be found between an emotionally arousing and an emotionally neutral condition (interpreting positive emotion as 'activating' and neutral states as 'calming').

The present study examines both EDA and conscious response psi measures. Recording the physiological measure is unlikely to interact with making a conscious response, although the opposite effect could occur. Thus, conscious responses are elicited from the participants for only half of each session, pseudo-randomly assigned to sessions' first or second half. As in the Boswell study, agents and percipients complete rating scales. Significant psi-hitting is predicted for both psi measures, as are significant correlations between the rating scale data and both psi measures. Exploratory analyses examining interactions between the two psi measures are planned (see the Hypothesis and Pre-Planned Analyses section, below).

Method

Participants

The experimenter for all sessions was the second author, SS, a medical student at Edinburgh University. She had no previous experimental experience and was trained by DD, who originated and designed the study. This training was based upon that which DD received from William Braud, who visited our lab in the summer of 1993 to help start our DMILS (direct mental interactions with living systems) research.

Sixty-four students from Edinburgh University participated in 32 sessions, with each session involving two participants (agent and percipient) who were 'close friends'. There were 41 female and 23 males, from 19 to 30 years old (median age, 21). SS recruited all participants, and each took part in only one session. The only selection criteria was willingness to participate in a parapsychology study.

Setting

All sessions were conducted in the laboratory facilities of the Koestler Chair of Parapsychology, during February and early March of 1994. For a detailed description of these facilities and their security measures, see Dalton, et al., 1994.

During the sessions, there were no sensory means of communication between the agent's room and the rooms of the experimenter and percipient. The experimenter and percipient communicated with each other via microphones and headphones.

Equipment

The percipient sat in a comfortably padded chair. Approximately five feet in front of the percipient a monitor displayed a colourful random pattern. A crystal ball, centered in front of the monitor, added an interesting, three dimensional aspect to the monitor display. Headphones conveyed ambient music to percipients, and also relayed communications from the experimenter. The music and display provided a random and variable stimulus to help keep the percipient engaged and alert during the experimental session. A small, clip-on microphone enabled communication of percipient's conscious responses and ratings to the experimenter. Two 9mm silver-silver chloride electrodes were attached by velcro bands to the first and third fingertips of the percipient's left hand. The physiological equipment was designed and built by Julian Isaacs, to specifications provided by Braud to enable accurate replication of his and his colleagues' DMILS research. Dennis DiBart programmed the software. For details about equipment, see Radin, Taylor, & Braud (1993).

In the agent's room, located 25 meters from the percipient's room, a monitor conveyed the appropriate sending condition (positive or neutral emotions). A form was provided upon which the agent ticked the appropriate condition (positive or neutral emotion) for each sending/influence period, and then rated the degree to which they were able to experience the appropriate emotion using a seven point scale.

In the experimenter's room, headphones and a hand-held microphone allowed the experimenter to obtain the percipient's conscious responses. A stop-watch, synchronized with the program controlling the sending/influence periods, determined the timing of the conscious responses. One tape recorder conveyed the ambient music tape to the percipient's headphones, and another recorded their conscious responses. The experimenter also recorded the percipients' responses and confidence ratings on a form. Percipients rated their degree of confidence in the accuracy of each of their conscious responses using a seven point scale.

Targets and Randomization

Agents used three strategies to fully experience and convey their emotional state: a) they tried to re-live the experience thereby re-experiencing it fully, as if it were again occurring; b) they tried, by means of wishing and willing, to have their friend (the percipient) mirror their own emotional state; and, c) they imaged their friend in a situation that would produce the desired emotions.

Just before the start of the experimental period, the agent listed four subheadings of memories which made them feel happy, excited and joyous, and four objects to which they had no emotional response; alternatively they could try to 'blank their minds' during neutral periods. During the sending/influencing periods, agents could re-use memories, add new ones or delete previous choices, as they wished, to provide stimulus that was immediately relevant to them and could be experienced as fully as possible.

In each session there were 32 emotional sending/influencing periods, each of 30 seconds duration (16 positive and 16 neutral periods). Each emotional period was followed/preceded by a 30-second "rest" period, during which the agent ceased experiencing the previous emotion and completed their rating forms. The presentation order of the emotional periods to the agent (i.e., rest-positive-rest-neutral; or, rest-neutral-rest-positive) was pseudo-

randomly assigned by the computer program at the beginning of each session. Instructions to the agent, appeared on the lower left-hand corner of the monitor, and remained on the screen for the duration of each 30-second period. Positive emotion periods were signaled by the word "Activate"; neutral emotion by "Calm", and rest periods by "rest".

For half of the emotional periods (eight positive and eight neutral), the experimenter would ask the percipient to make a conscious response about which emotional state the agent was experiencing, and to rate their degree of confidence their response's accuracy. The conscious responses were elicited either during the first or the second 16 emotional periods of each session. The conscious response and confidence rating was made during the 'rest' periods following each emotional period. The agent was unaware of whether the conscious response would be made in the first or second half of the session; this having been pseudo-randomly assigned by DD (who was not otherwise involved with conducting the sessions), using random number tables (Rand Corporation, 1955) before the start of the study.

Procedure

Participants arriving for their sessions were offered refreshments and encouraged to talk about their own psi experiences, backgrounds and interests. The experimenter then tailored the description of the study to best fit the participant's interests and experiences. The task was presented as a "team" effort, involving the cooperation of both the percipient and agent. After describing the study, the experimenter mentioned previous successes in similar studies conducted at Edinburgh and elsewhere, and conveyed expectations of success for the session. Participants then decided who would be the agent and the percipient. These talks lasted 20 to 60 minutes, depending upon how long the participants wished to chat.

When ready to begin the experimental session, the experimenter, agent and percipient toured each others rooms, with the equipment in each being described and their function explained. The agent was left in their room to list the memories and objects that would help them experience positive and neutral emotional states.

The percipient and experimenter returned to the percipient's room. The headphones were fitted; the preferred volume of ambient music determined; the chair comfortably positioned; the monitor display turned on; the crystal ball centered in their line of vision; and, the microphone clipped on to the percipient. The experimenter then attached the electrodes to the percipient's hand, while further describing their function (the electrodes were always described as "sensors"). After attaching the electrodes, the hand was comfortably positioned with the palm facing upwards. The percipient was instructed to remain relatively still during the session, and to avoid any unnecessary hand movement.

After having listed their memories/objects, the agent returned to the percipient's room. Any further queries were answered, the percipient made a gentle wish that at the appropriate time their body would automatically and effortlessly respond appropriately to their friend's mental influence, and both participants wished each other luck. Then the light in the percipient's room was dimmed, the experimenter and the influencer left the room and the ambient music tape was started.

The experimenter accompanied the agent to their room. The EDA amplifier device was turned on and the BSR was recorded for one 30-second period; then the amplifier was switched to the GSR channel and the percipients' EDA was observed for two 30-second periods, to ensure that the equipment was functioning correctly. A cardboard shield was then placed on the screen to cover the EDA tracings, so they would not distract the agent. When the agent was ready, the experimenter started the session by pressing a computer key, whilst simultaneously starting the stop watch to time the occurrence of the conscious responses. The agent would then follow the influence and rest instructions that were displayed on the monitor.

After starting the session, the experimenter quickly returned to her room and opened the envelope specifying whether the conscious response measure would be taken during the first or second half of the session. Percipients were told the conscious response measure was about to be taken during the rest period preceding the first influence period to which they would be responding (i.e., either in rest period 1 or rest period 33). Thereafter, at approximately one minute intervals (a 30-second rest + 30-second influence period), the experimenter asked the percipient for their conscious response and confidence ratings. Percipients knew to respond quickly and not think too much about their answers. The experimenter recorded the percipients' responses on a form, as well as tape recording them.

After the experimental session, participants discussed their experiences. If they wanted feedback, the experimenter obtained the results of the physiological analyses from the computer, and quickly calculated the conscious response measure.

Hypotheses and pre-planned analyses

Primary Analyses

1. These are the primary, pre-planned analyses.

a. Overall there will be significantly more EDA activity for positive than for neutral sending periods, analyzed by a single sample t-test on all the z's from the Wilcoxon tests used to analyzed each session's data. This is the primary measure as the authors think the results from the Wilcoxon test are more representative of the overall session than the PSI ("Percentage Score Index") score measure reported in the work of Braud and his colleagues (Braud & Schlitz, 1991) which can be strongly influenced by one extremely successful/unsuccessful 30-second influence period; however, to allow better comparison with the findings reported in Braud and Schlitz, 1991, overall findings based on this measure will also be reported.

b. There will be significant overall positive psi-scoring on the conscious response measure (exact binomial test).

Secondary Analyses

2. Differences in conscious response hit rate between the two emotional conditions will be examined by a chi-square test for homogeneity.

3. The degree of the agents' involvement in experiencing and conveying their emotions, as measured by their rating scales, will correlate significantly and positively with the data from both psi measures (analyses: Pearson's correlation for EDA data; point biserial correlation for conscious response data).

4. The degree of the percipients' confidence in their conscious responses, as measured by their rating scales, will correlate significantly and positively with the data from both psi measures (analyses: as in 3 above).

5. Low involvement by the agent will correlate significantly and positively with low percipient confidence (analysis: Pearson's correlation).

Exploratory Analyses

6. These exploratory analyses will evaluate the impact of the two psi measures upon each other. Also, these analyses will examine for possible within session scoring declines (due to the software programming, our sessions were approximately a third longer than those typically used by Braud, which raised concerns about potential decline effects). All these analyses will be two-tailed, except where otherwise stated.

a.. The scoring from the two psi measures will correlate significantly and positively with each other over all the session data (analysis: point biserial correlation, the data from half of each session used as appropriate).

b. The two measures are correlated with each other using the data from each half session (analyses: as above in 6.a., the data from half of each session used as appropriate)

c. There will be significantly different EDA during positive emotional sending periods versus neutral in relation to the presence and absence of the making of conscious responses, overall and for the data from each half session (analyses: as above in 1.a., the data from half of each session used as appropriate).

d. To explore for EDA within session decline effects, without regard to the conscious response measure, EDA psi-scoring from the first and second half of each session are examined (analyses: as above in 1.a., the data from half of each session used as appropriate).

e. In the conscious response measure, within session decline effects will be explored by examining psi scoring when the guesses were made in the first and in the second halves of the session (exact binomial tests).

f. In the conscious response measure, differences in scoring rates between the positive and neutral conditions will be explored according to whether the conscious response was made in the first or second half of the session (analyses: chi-square tests for homogeneity).

Results

For each session, the programmed statistical analyses for the EDA recordings provided a Wilcoxon matched-pairs signed ranks test where the matches are between the 16 sets of positive and neutral emotion periods, with the Wilcoxon score in turn being transformed into a z score. As the EDA matched pair differences were calculated from 'Neutral - Positive', a negative Wilcoxon score indicates psi-hitting. A PSI score was also provided for each session where the sum of all the EDA during the active periods was added to that of the neutral periods, and then divided by the sum of the neutral. Under the null hypothesis, this figure would be 50%, with a lower percentage indicating greater activity during the positive emotion periods. Conscious response results were obtained by comparing the percipient's calls to the order of the influence periods recorded on the agent's form.

It had been pre-determined to exclude any sessions which did not result in a full set of data. Four sessions were so excluded, three due to incorrect completion of the agent's form, and one due to loss of electrode contact.

See Appendix 1 for a summary table of the study's data.

1.a. Overall, significantly higher arousal was obtained during the positive emotion periods than during the neutral periods ($df = 31$, $t = -1.77$, $p = 0.043$, one-tailed; effect size = 0.31). (Overall outcome from the PSI scores were: $df = 31$, $t = -1.414$, $p = 0.08$; effect size = 0.25)

b. No significant psi scoring was found in the conscious response measure (MCE = 256 hits, obtained hits = 261, exact binomial $z = .40$; effect size = 0.07).

2. No significant differences were found between conscious responses to positive emotional and neutral agent states ($df = 1$, $x^2 = 0.20$).

3. The degree of the agent's involvement were correlated with both psi measures. To perform this correlation for the physiological measure, the EDA score from each set of matched-pairs of emotions was correlated with the sum of the two (corresponding) agent ratings for the same matched-pair (resulting in a range of rating scores from 2-14); a negative score indicates scoring in the predicted direction. The outcome from this correlation was not significant ($df = 512$, $r = -0.0206$). To perform this correlation with the conscious response, the ratings were correlated with the corresponding conscious response where a hit was assigned a value of 1 and a miss a value of 0 (a positive score

indicates scoring in the predicted direction). This correlation was not significant for the conscious response measure (df = 512, r = 0.013).

4. Using the same method described in 3. above, the degree of the percipient's confidence in the accuracy of their conscious response, as measured by their confidence ratings, did not correlate significantly with either psi measure (for the EDA measure, this analysis used the appropriate matched-pairs from each half session for which ratings were available: df = 254, r = -0.079; conscious response data: df = 512, r = -0.040).

5. The correlation between the degree of the agent's involvement and the degree of the percipient's confidence in the accuracy of their responses for corresponding data was not significant (df = 510, r = 0.013).

6a. To explore the interactions between the two psi measures, the EDA activity score resulting from each set of matched-pairs of positive and neutral periods was correlated with the conscious responses for each appropriate set of calls, where a value of 1 was assigned to correct calls, and 0 to an incorrect calls, and these values summed for each pair. Again, a negative value indicates a positive correlation between the two measures. There was no overall significant correlation between the two psi measure (df = 254, r = -0.0376)

b. To explore for within declines in the correlation between the two psi measures, two further correlations were conducted upon the data collected in the first and second half of the session, using the same analysis method as in 6.a. Neither correlation was significant (data from the first half of each session: df= 126, r = -0.095; data from the second half: df = 126, r = 0.003).

c. To explore conscious response influences upon EDA, EDA was examined both in the presence and absence of the conscious measure. There were no overall significant EDA psi effects either with the response (df = 31, t = -1.44), or in its absence (df = 31, t = -0.27).

d. There was a highly significant EDA psi effect (positive > neutral) in the data corresponding to the conscious responses being made in the first half of the session (df = 15, t = -4.14, $p < 0.001$, two-tailed). In the EDA data obtained when responses were made in the second half of the session, there was no significant effect (df = 15, t = 0.21), with there being slightly greater activity elicited by the neutral condition. No significant degree of EDA psi activity was found in the absence of making conscious responses in either of the half sessions (first half: df = 15, t = 0.34; second half: df = 15, t = -0.94).

e. To examine for a possible decline effects, the EDA for the two halves of each session were examined, without reference to the conscious response. The EDA data from neither half session was independently significant (first half: df = 31, t = -1.57; second half: df = 31, t = -0.28). Exact binomial tests showed the hit rate of the conscious responses were not significant regardless of in which session half the data was collected (for both sets of data, N = 256, MCE = 128 hits; first half: obtained hits = 139, exact binomial z = 1.31; second half: obtained hits = 122, exact binomial z = -0.81. The outcome of two binomial tests prompted a post hoc test of the difference between the two z. This result approached significance (z = 1.50).

f. Tests for homogeneity revealed no significant differences between the hit rate for positive emotions or neutral states, for the data collected in either half session (first half: df = 1, $x^2 = 1.91$; second half: df = 1, $x^2 = 0.56$).

Discussion

Our significant overall EDA findings further support those from the 15 EDA series reported in Braud and Schlitz (1991). As previously noted, we prefer the use of a t-test of the Wilcoxon z's produced by each session as an overall psi measure, to the PSI score measure used by Braud and his colleagues. As it happened, our outcome using this measure is

significant, whereas the PSI score measure failed to reach overall significance ($p = 0.08$). However, the effect size from our data when analyzed using the PSI score method, was exactly the same as the mean study effect size reported by Braud and Schlitz for their EDA studies (i.e., es = .25).

Given this finding, alternatives to the psi hypothesis must be considered. There were two primary analyses conducted in this study, which suggests the significant EDA finding is not a multiple analysis artifact. Its close approximation to previous findings further supports a psi hypothesis. Whilst we were unable to eliminate all possible means of communication via signaling devices, the policy of never allowing the same participant to take part in more than one trial, and the fact that no participant pair was extremely successful on both psi measures (see Appendix 1) argues against a fraud interpretation.

The absence of significant psi-hitting in the conscious response measure is disappointing, especially in view of Boswell's promising results. Similarly discouraging is the absence of any significant findings involving the rating scales. The absence of psi-hitting in the conscious response measure, and the lack of any significant correlation between the two psi measures suggest that of the two psi measures (conscious and unconscious), the physiological, unconscious measure may be the more sensitive of the two, able to detect psi responses which were not consciously accessible to the percipient. These findings follow the same pattern found by Tart (1963) and Targ and Puthoff (1974). However, the exploratory analyses conducted to explore the relationship between the two psi measures indicate that their relationship may be more complex than is evident from the overall results.

These exploratory analyses reveal the overall EDA significance stems largely from the data collected in the first half of each session when percipients also made a conscious response. However, as the EDA results are in the wrong direction and not significant when responses were made in the second half of the session, this finding does not associate successful EDA psi detection with the making of conscious responses (regardless of the accuracy of such). Similarly, the lack of significant EDA psi scoring in the first half of the session with no response being made, with the EDA being in the wrong direction, argues against a straightforward interpretation of a decline effect. However, there is a nearly significant decline in scoring in the conscious measure depending upon whether responses occur in the first or second half of the session. Also, while clearly non-significant, the correlation between the two psi measures is in the right direction (a positive correlation) for data collected in the first half of the session, whereas there is a negative correlation for the data obtained in the second half of the session.

Multiple analysis considerations dictate that one does not read too much into these exploratory findings. However, using a conservative method of correcting for multiple analyses (Bonferroni), of the 24 analyses in this study (some of which are not completely independent), only one result would be expected to reach significance at the $p < 0.25$ level. Yet there were two significant outcomes, one reaching significance at the $p = 0.001$ level. Also, the outcomes of most of the other analyses, although non-significant, are in the psi-hitting direction. Thus, some speculation about these exploratory findings may be warranted.

That very significant psi-scoring was obtained with the EDA measure in the first half of the session with conscious responses also being elicited, and a reversal of the EDA effect (neutral > positive) in the first half in the absence of conscious responses, may indicate that conscious responses added some 'boost' allowing greater psi detection on the physiological measure. Perhaps making a conscious response allows for unconscious, internal timing by percipients as to when the influence periods were occurring, which in turn leads to greater (unconscious) detection of the relevant agent state. However, the results indicate this 'sense of timing' was not carried over to the session's second half.

Another interpretation involves participant motivational and fatigue effects. The EDA scoring reversal during the first half of sessions in the absence of conscious responses,

argues against a decline related to either agent fatigue or lessening of agent motivation. However, making conscious responses may have changed the percipients' motivational levels. The significant EDA psi-scoring in the first half of sessions with the presence of conscious responses, may suggest the responses keep the percipient more alert and motivated to think "something is happening" with regard to psi activity, than during the first half of each session with no conscious response (i.e. percipients didn't 'notice' anything going on). Similarly, participants not making conscious responses in the first half, may think "nothing is happening", and lose their motivation or expectation for success by the time they make responses in the session's second half. The slightly below chance scoring in the second half session data in both psi measures, when responses were not made during the first half, may reflect this lessening of percipients' expectations of success and motivation. A related interpretation of these results is that they represent a preferential effect (Rao, 1965).

Another possibility is that when percipients wait half a session before making their conscious responses, the anticipation of making responses created a source of distracting "noise". Thus, the lack of positive psi EDA activity during the first half of the session in the absence of making responses is due to percipients 'anticipating' the conscious measure, with this anticipation (and perhaps uncertainty as to when they would need to quickly respond verbally), resulting in their being less "open and receptive" physiologically.

One final consideration is that the experimenter was a medical student who was especially interested in the physiological measure, and its implications for medicine. Thus any experimenter effects may have influenced the EDA results, but not the conscious response outcomes.

Other interpretations of these exploratory findings are possible. However, multiple analyses and the lack of significance of most of the findings being discussed, argues against reading too much meaning into these speculations.

The lack of significant difference in the hit rates between positive and neutral emotional states does not support the superiority of emotionally positive targets, but with no significant psi-scoring in this measure, no inferences should be drawn. The significant psi-scoring in the EDA measure suggests positive emotions and neutral states approximate the "activate vs. calm" conditions used by Braud and his colleagues. This study thus provides a conceptual replication of their EDA findings.

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