PHYSIOLOGICAL CORRELATES OF ESP: HEART RATE DIFFERENCES BETWEEN TARGETS AND NON TARGETS IN CLAIRVOYANCE AND PRECOGNITION FORCED CHOICE TASKS

Luisa Sartori, Stefano Massaccesi, Massimiliano Martinelli & Patrizio E. Tressoldi
Department of General Psychology, Padova University

ABSTRACT

Physiological reactions are still considered by most contemporary theories to take place only after stimulation has occurred. Yet recent studies have suggested that the autonomic nervous system can act as a reliable predictor of a future experience (Radin, 1997; Radin & Bierman, 1997, 1998; Bierman, 2000; Radin, 2003; Spottiswoode & May, 2003). Physiological reactions to incoming stimuli can occur without perceptual and cognitive encoding, and these are the very first reactions of the human organism.

This paper reports the results of two different experiments carried out in order to examine such physiological effects and collect further data without the use of arousing materials. We opted for very easy decision-making tasks instead of using violent/erotic pictures in order to avoid ethical problems and to find a scientific paradigm that may also be extended to children.

Spinelli (1980) found out that children up to age eight showed remarkable ESP ability. Parapsychological research with children can be challenging.

More specifically, the present study aims to evaluate heart rate differences during the presentation of targets and non-targets in classical clairvoyance and precognition forced-choice tasks. The gambling-like task consists of a serial presentation of four calm pictures: subjects have to guess which one will be randomly selected as a target. In each trial the target was selected automatically by a pseudo-random algorithm: in the clairvoyance condition, targets were selected before participants did the trials; in the precognition one, targets were determined right after subjects have made their choice.

This procedure was repeated for twenty trials. For each picture presentation, a sample of ten heart rate data was collected. The experiments involved 12 participants who together contributed 240 trials.

The first purpose was to independently replicate and extend the results of previous experiments demonstrating the presentiment effect. The second objective was to examine whether the heart is able to receive information still outside the range of conscious awareness.

Results were significant in both experiments: heart rate associated to targets increased at a statistically significant level compared to non-targets in the clairvoyance condition ($p = .0007$; $d = .054$) and in the precognition one ($p = .03$, two-tailed; $d = .039$), whereas the mean of hits scores in the guessing task was close to the chance level. Results furthermore showed a statistically significant Stouffer value as regards within subjects data: we interpreted these findings in light of research on individual reaction patterns (Lacey & Lacey, 1970).

In conclusion, the present results lend support to the hypothesis that Heart Rate may be a reliable physiological variable to detect ESP cognitive information even if targets overt identification is at chance. The heart appears to play a direct role in the perception of future events.

This area still provides much potential for further research.

INTRODUCTION

Can ESP information be detected physiologically? This is a plausible hypothesis assuming that ESP information differs from non ESP information only in how it is obtained and not in how it is processed. Different authors demonstrated that information not detected at an overt conscious level produces physiologically specific modifications (Dimberg, Thunberg, Elmehed, 2000; Kubota, Sato, Murai, Toichi, Ikeda, Sengoku, 2000; Mayer, Merckelbach, deJong, Leeuw, 1999; Bechara, Tranel, Damasio and Damasio, 1996; Bechara, Damasio, Tranel and Damasio, 1997).

In the field of ESP research the search for a physiological index is not a new interest. Beloff (1974) more than 25 years ago reviewed the studies related to this topic. Recently, Bierman and Radin (2000) reported a replication of their finding that skin conductance level, blood volume and heart rate change according to the emotional category of future pictures. This so called pre-sentiment effect has been replicated by Bierman and Scholte (2002) using fMRI data.

Moreover, further evidences actually support the possibility that similar physiological effects may be observed in tasks without emotional contents. Mc Donough, Don & Warren (2002) detected an EEG activity in the gamma band correlated to a forced choice guessing task confirming previous findings of the same authors (Don, Mc Donough and Warren, 1998) as regards event-related brain potentials.

In this paper we decided to use a task very similar to that one used by Mc Donough et al. (2002), but with an easier technology: we recorded heart rate pulses instead of EEG activity. The purpose was to investigate if this task might produce different results with a clairvoyance or a precognitive condition, and we devised two identical experiments simply changing the moment of the target choice. In the clairvoyance experiment the target was chosen before the presentation of the first picture, whereas in the precognitive experiment it was selected after the subject's choice of the target. The main hypothesis was that heart rate could change according to the categories of pictures, targets vs. non targets. The direction of this difference was not predictable in advance because, at our knowledge, there are not similar evidences in literature.

METHODS

Participants

Twelve voluntary subjects were tested. The proportion of male and females was close to 50%. Mean age was 26,5 years-old (range 24-45). Their performance was reimbursed with € 3.

Procedure

Participants seated in a comfortable chair in a soundproof laboratory. A video monitor was located in front of the participant at eye level and a computer mouse was held in his/her dominant hand. They were instructed not to move their index finger of the nondominant hand, connected to the apparatus detecting their heart rate, to relax when an acoustic signal was perceived and to concentrate on the picture that would be shown for about 10 seconds on the monitor (depending on the time necessary to collect 10 heart rate data based on inter-beat intervals) until it disappeared. This sequence would have been repeated four times with different pictures that subsequently would have been presented simultaneously on the monitor. After the presentation of the four pictures, the participants were invited to guess the target by clicking with the computer mouse the selected picture. After the choice, the real target was illuminated to inform the subjects about the accuracy of his/her choice.

The experiment ended after 20 trials, always using different pictures. Pictures represented coloured calm images, i.e. landscapes, plants, flowers, portraits. Their degree of emotionality was measured asking to ten independent judges to rate each picture on a ten points scale from 0 (no emotion) to 10 (high level of emotion). The mean score was 1.5, SD .5.

The sequence of events for each trial is illustrated in Fig. 1.

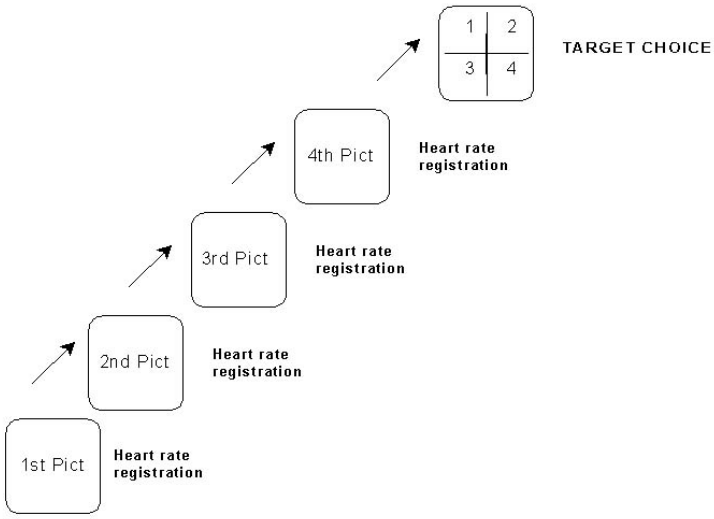

Fig. 1: Scheme of the sequence of events for each trial

The target was selected among the four pictures by an automatic randomisation procedure. The Randomisation procedure written in C++ for these experiments returned a random number within the range 1-4 (corresponding to the four pictures) after an initiation with a random algorithm seeded by computer clock.

Data acquisition and apparatus functioning were continuously monitored by a research assistant placed behind the subject. Owing to the automatic procedure, the research assistant could not have suggested anything. If some artefacts were noticed (for instance anomalous heart rate registrations or apparatus malfunctioning), the task was interrupted and restarted again.

Half subjects performed first the clairvoyance experiment, the other half the precognition one.

Heart rate sampling.

For each picture ten heart rate samples were obtained by a connection between the Cardiofrequencimeter and the computer. The Cardiofrequencimeter consisted of an opto-electronic sensor for a photopletismographic measurement by infrared light applied to the index finger of the nondominant hand. The signal was conveyed to a cardiofrequencimeter Pulse Monitor-701 and to a digital multimeter Metex 3850 D and subsequently fed in a PC for online data acquisition. These data were obtained from the parallel port from which the analogical signal was converted in digital form. The software for pictures presentation and heart rate data acquisition was original and devised for these experiments (Massaccesi, 2001).

Data analysis

The initial 800 data of each subjects (10 seconds x 4 pictures x 20 trials) were reduced to 400 (10 seconds x 20 trials) collapsing the data related to targets and non targets within each trial (200 for targets and 200 for non targets). A simple paired t test was used to compare hear rate means related to target and non targets.

RESULTS

Clairvoyance experiment.

The overall comparison between targets and non targets yielded a statistical significant difference of 0.56, (C.I. 95% ± .33), paired t test: $t_{(2399)} = 3.4$; $p = .0007$; Effect Size $d = .054$ (Dunlap. Cortina, Valow, Burke, 1996). To control the reliability of this result we implemented a bootstrap analysis[1] with the Simstat™ software (Péladeau, Lacoutre, 1993) using 1000 resamples. The result was:

$t_{(2399)} = 3.38$ (C.I. 95 ± 1.98).

The mean of correct hits was close to the chance level, M = 6.08; SD = 1.37.

Precognition experiment

The overall heart rate raw difference between target and non target of 0.39 (C.I. 95 ± .36) was statistically significant, $t_{(2399)} = 2.16$; $p = .03$ (2-tailed); Effect size $d = .039$. This result was confirmed using the bootstrap procedure using 1000 resamples, $t_{(2399)} = 2.19$ (C.I. 95% ± 2.03).

As in the clairvoyance experiment, the mean of hits was at chance level, M = 5.6, SD = 2.05.

Experiment comparison

The differences between targets and non targets in the two experiments are better illustrated in Figure 2a and Figure 2b.

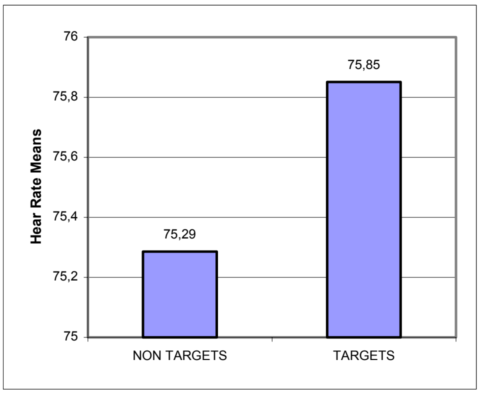

Fig. 2a Heart rate means of targets and non targets in the clairvoyance experiment.

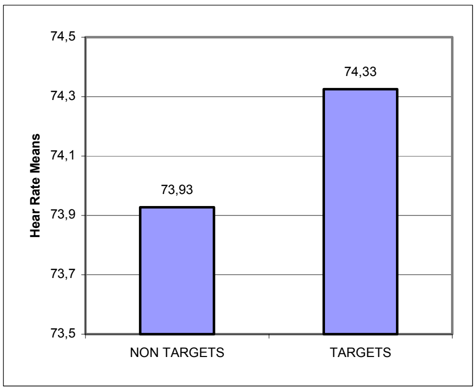

Fig. 2b Heart rate means of targets and non targets in the precognition experiment.

The differences between targets and non targets in the two experiments are not statistically different $t(2399) = .68$.

[1] Bootstrap simulation is a resampling technique whereby initial sample are treated as if they constitute the population under study. By replicating those data an infinite number of times, we then draw at random from that population a large number of samples, each one the same size as the original sample. By computing, for every bootstrap sample, a statistical estimator of interest (such as a mean, a correlation or a t-test between two variables), this resampling procedure recreates an empirical sampling distribution of this estimator. The main advantage of such a procedure is that the sampling distribution is not mathematically estimated but empirically reconstructed with all the original characteristics of the data. So, it takes automatically into account distribution properties that are generally considered as contaminating factors, such as skewness, ceiling effects, outliers, etc. This feature makes bootstrap estimations adequate even when data are not normally distributed. In fact, bootstrapping can even be used to describe the sampling distribution of estimators for which sampling properties are unknown or unavailable.

Meta analysis using single data.

Given the high number of data for each subject it is possible to analyse the reliability of the differences between targets and non targets in the two experiments calculating a Stouffer z from the t values obtained from each subject. The individual t test and the Stouffer value are presented in the Table 1.

Table 1: Individual t values of each subject in the two experiments with Stouffer z value.

	Clairvoyance	Precognition
X1	-0,99	-0,55
X2	-1,48	-0,19
X3	-1,42	0,26
X4	0,61	-1,17
X5	-0,88	0,7
X6	-3,1	-1,48
X7	-1,39	-0,2
X8	-1,49	0,78
X9	2,43	-3,4
X10	-1,63	-0,05
X11	-2,57	-2,64
X12	0,06	1,7
Stouffer z	-3,42	-1,8
p (2-tailed)	0,0003	0,036

For both experiments the Stouffer value is statistically significant and also their difference, z = 1.6; p = .054.

DISCUSSION

With a simple procedure we have obtained a clear evidence that the heart rate is a physiological variable sensible enough to differentiate two categories of information that will be known in the future. Even if the raw difference is very low, less than one heart rate bit per second on average, it seems quite reliable as demonstrated by the analysis of our data. The difference between the clairvoyance and the precognition experiment seems not very reliable, even if in the second condition the heart rate difference between targets and non targets appears less evident. However, in both experiments, at the overt cognitive level, the means of hits is close to chance.

Our findings offer new evidence that it is possible to detect ESP signals at a neuro-physiological level adding convergent support to the EEG pre-knowledge paradigm investigated by McDonough and coll. (2002). A critique to these "ESP physiological signals" is that not only they are so weak to be practically undetectable by the subjects but also that they are extracted from a relatively high number of trials giving a statistical high power to detect very low effect sizes. This critique is correct, however if these physiological signals are real pre-(overt) cognitive information, we can start to investigate if it is possible to extract a "prototypical pattern" distinguishing targets from non targets at the level of single or less numerous trials; for example, using algorithms implemented in neural networks. Another possibility is to manipulate the "physiological signal" enhancing the differences at a level detectable by the subjects. The theoretical contribution of Stevens (2000) about Stochastic resonance (SR) a phenomenon wherein some characteristics of the signal (amplitude, signal-to-noise ratio, coherence, etc.) are, counter to intuition, actually improved by the presence of the noise, may be another useful approach for this line of investigation.

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Address for correspondence: Patrizio E. Tressoldi,
Dipartimento di Psicologia Generale, Via Venezia, 8,
35131 Padova, Italy.
E-mail: patrizio.tressoldi@unipd.it