

Possible Paranormal Components of Anticipation: Psychophysiological Explorations.

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Four experiments were carried out in an investigation of the possibility that the contingent negative variation (CNV) could show evidence for a precognitive component of anticipation. The CNV is a slow negative EEG potential that arises when a person anticipates an event requiring a response. Although the findings are often unreliable and sometimes inconsistent, CNV amplitude has been related to a number of psychological functions such as expectancy, intention to act, general motivation, attention, and arousal.

In accordance with the standard procedure for CNV research, a constant foreperiod reaction time paradigm was used. A warning stimulus (S1) was followed in a short period by another stimulus (S2), which was either a red or green light. If S2 was green, the subject pushed a button as quickly as possible, while no response was required for the red S2. The decision as to whether S2 was red or green was made by a Schmidt binary RNG ($P = 1/2$) immediately before the light was displayed. If subjects were precognitively anticipating the need to push the button, the amplitude of the CNV should be larger for green S2 than for red S2. Analyses for ESP were carried out by comparing the proportion of times the green light came on for trials with CNV amplitudes above versus below the mean for each subject.

The first study was carried out in 1974 and had five subjects. The S1-S2 interval was 1.25 seconds. For the first three subjects an absence of a green light for S2 rather than a red light meant that no response was needed. Each subject did two runs, both emphasizing the reaction-time task; but in the second, the subjects were also asked to use PK to make the green light come on. A preliminary analysis¹ found, for the first run, an overall effect at the .05 level, with the data of two subjects being independently significant. However, several mistakes were made in that analysis. A reanalysis was carried out on the data of only three subjects, as the data of one of the previously significant subjects were inadvertently lost and the data of another subject were discarded because of the presence of severe skin-potential artifacts. The overall result of the reanalysis was nonsignificant. The subject whose results had been independently significant with the original analyses ($p < .05$)

¹ Levin, J., & Kennedy, J.E. The relationship of slow cortical potentials to psi information in man. *Journal of Parapsychology*, 1975, **39**, 25-26 (Abstract)

showed increased significance ($p < .005$) in the reanalysis. For the second run, there was no evidence of an ESP component of anticipation and no evidence for PK.

In the second experiment 10 subjects each completed about 20 practice trials followed by a 30-minute experimental run (approximately 240 trials). The overall results were nonsignificant for the experimental trials but a suggestive ($p < .05$) effect was found for the practice trials. (Technical problems prevented the recording of data for the practice trials of one subject.) Movement artifacts, a general problem in CNV research, were more of a problem in these data so more strict selection criteria were applied to discard contaminated data. When the stricter criteria were applied to the practice trials, the significance of the results increased to $p < .02$, with eight of the nine subjects performing in the expected direction.

After the second experiment was completed, new evidence appeared indicating that some of the reliability problems with CNV research were eliminated if the S1-S2 interval was made longer than the standard 1 to 1½ seconds. For the third experiment, 10 subjects were tested with a three-second S1-S2 interval. Besides the 20 practice trials and an experimental run of 60 trials, a condition with no warning light and no red light was added. EMG activity of the responding arm was also recorded. All results for the CNV were nonsignificant. (Again, data for the practice trials of one subject were not available because of technical problems.) The EMG data for the experimental run showed a significant reversal from the psi-anticipation hypothesis, i.e., the subjects' arms tended to be tenser on no-response than on response trials. The EMG data for the practice and "green only" trials were at chance.

To test the validity of the CNV as a measure of anticipation, one subject performed in a sensory condition in which the red and green alternated (and thus the subject knew what to expect). It was discovered that *with the standard measure of CNV amplitude, the two types of trials could not be distinguished in the sensory condition*. However, if the CNV was measured relative to a different baseline, the amplitude did significantly distinguish the green versus red trials.

A fourth experiment was carried out with four subjects primarily to investigate the reliability of the CNV as a predictor in the sensory (alternating) condition. The results verified that the standard measure of CNV amplitude (which had been developed with shorter S1-S2 intervals) did not distinguish trials for the present condition, while the other measure did. (ESP conditions were also used in this experiment but the results showed no suggestive trends.) When the experimental data for the third experiment were reanalyzed with the new measure of CNV amplitude, the overall results for the practice trials were not significant but eight of the nine subjects were in the expected direction. Reanalysis of the other conditions for Experiment 3 showed no suggestive trends.

While these results are somewhat encouraging, they are basically inconclusive. The planned analyses were generally not significant and the suggestive results were from post hoc analyses carried out as a result of methodological uncertainties in CNV research. It will not be possible to

evaluate these results until more is known about CNV methodology, particularly the effect of movement artifacts and the effects of using different measures of CNV amplitude. Various analyses were done on these data that may be of interest to those investigating CNV methodology. The use of the CNV to investigate possible psi components of anticipation was tabled since the author was more interested in psi research than in methodological problems in CNV work.—*Author's abstract*

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