Recent Advances in Human Neurophysiology

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Detection of deception with P300

ygraph, voice-stress analyzer.

Introduction

Presently, the measures of autonomic arousal, such as polygraph and voice-stress
analyzer, are widely u

First, ERPs have been shown to be

cesses, including some unconscious processes which cannot be inhibited by sub-
jects [5]. Second, because ERPs presumably reflect the activities of the central

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...nervous system related to information processing rather than emotion-dependent activities of autonomic nervous system, the methods used to escape the detection of traditional techniques will be null [6]. Rosenfeld et al. used P300 as an indicator to detect guilty knowledge [7]. In their experiment, a larger P300 was elicited by an "oddball" stimulus — the item supposed to be stolen by the subjects. N400 component was firstly described by Kutas and Hillyard [8]. They compared ERPs produced in response to words which completed sentences in a semantically anomalous fashion with ERPs produced in response to completions that were semantically normal. For the semantically anomalous completions, a negative-going component in the ERPs, maximal in the central and parietal areas, was elicited approximately 400 ms after the onset of the final critical word. No such negative component was noted for the semantically normal completions. More important for its use in detection of guilty knowledge, the N400 effect has also been associated with the truth value of sentence read by a subject [9]. Boaz et al. [10] used the mismatch between context phrase-test word format (e.g., "A type of bird, Robin") to elicit N400 component to detect guilty knowledge. Such a mismatch can only be detected by people who had guilty knowledge of the crime.

...bject (16 to 25 [?] years and all of the subjects were men. All subjects...

...Materials...

...subjects. Guilty knowledge test (GKT) taking question-answers format was constructed according to the crime. Each of 18 questions comprised five answers including one relevant item (RI) and four irrelevant items (II). Each of the total 90 items was a word with 2–3 Chinese characters. It was relevant items, but not irrelevant items, that were semantically congruous with the question accord...

...en subject and screen was 1 m.

EEG was recorded from location F3, F4 and Fz according to the international 10-20 system and was referenced to linked ear...

...the screen followed by five items in a series...ought to answer to every item with "yes", "no" or "do not know" by pressing "g"...

"j" or "h" on the keyboard. Try your best to appear innocent during this interrogation, even if you were the thief.

Every question was presented for 5,000 ms. Each of the five corresponding items was presented successfully for 300 ms, starting 1,000 ms after the offset of the question. There was an interval of 4,000 ms between the reaction of the subject and the presentation of another item. The collection of EEG data started
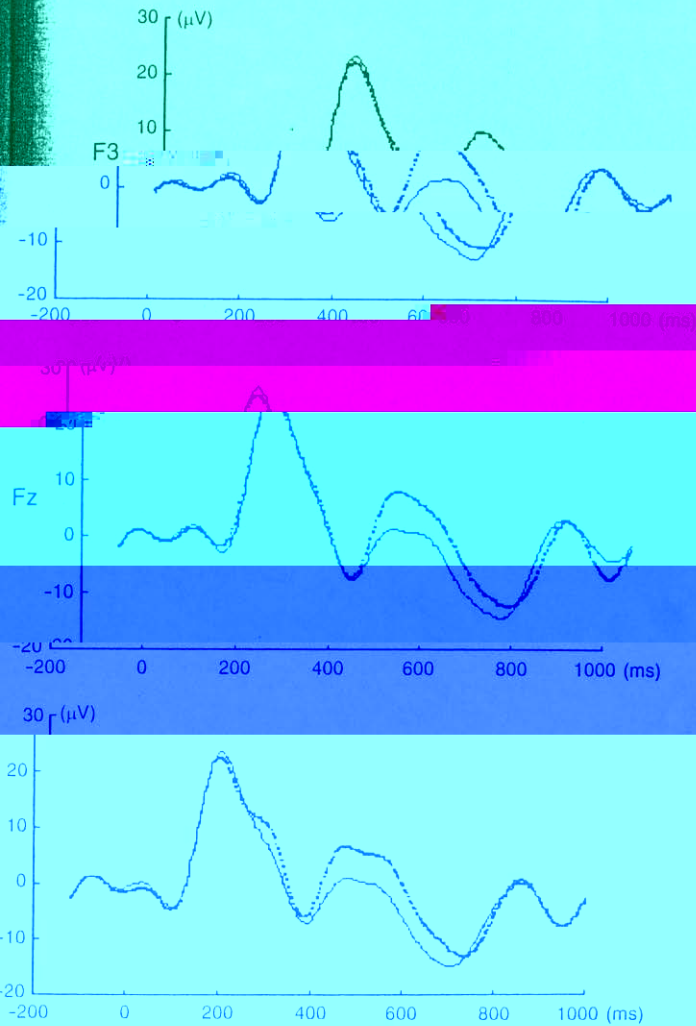
Grand averaged ERPs elicited by I (solid line) and II (dashed line) at F3, Fz and F4 (n = 18).

P300 has been hypothesized to reflect updating of memory or surprise. Its amplitude is determined by subjects' attention and small probability of significant stimuli to subjects. All subjects learned new information in the laboratory and T on that information was constructed. Among the five items (including one ant item and four irrelevant items) following a question, only relevant items semantically congruous with the question, so it was significant to subjects. nwhile, its probability was 20%.

Table 1. Amplitudes of the ERP peaks.

	Fz	F4
P300		
RI	9.31 (7.52)[a]	7.59 (6.31)[a]	5.94 (6.80)[a]
II	1.66 (4.40)	1.49 (5.76)	1.46 (5.66)
N400		
RI	− 5.09 (6.54)	− 7.51 (5.33)	− 6.60 (5.66)
II	− 6.79 (3.97)	− 8.02 (4.34)	− 7.26 (4.04)

Note: mean (SD) (μV) peak-to-baseline amplitudes of P300 and N400 elicited by RI and II at F3, Fz and F4 (n = 18). [a]p < 0.001 (paired t test) between RIs and IIs.

N400 reflects semantic processing of words in context. N400 component was also observed for false sentences pertaining to episodic information learned by subjects in the laboratory (e.g., "Diane is a lawyer") in which the sentence endings a
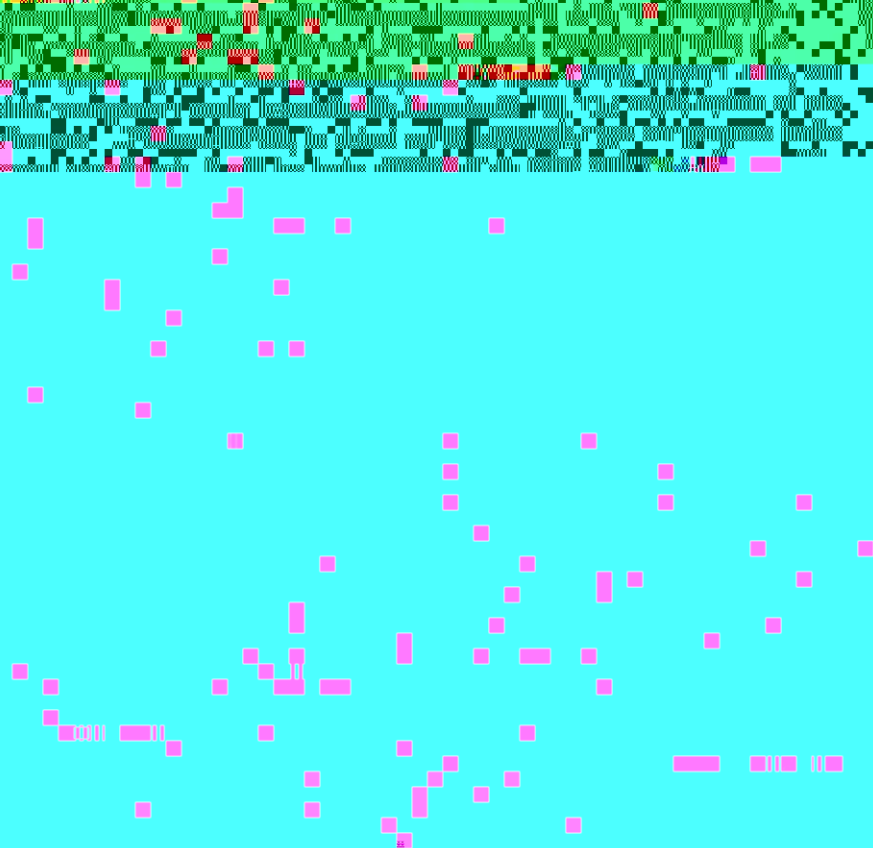
founding variables and examiner bias. Thus ERPs show promise as a method for detecting the presence of guilty knowledge.

Acknowledgements

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