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主 論 文 の 要 旨

論文題目 Effects of emotional arousal at memory encoding on the P300-based Concealed Information Test
(P300 を用いた隠匿情報検査における符号化時の覚醒の効果)

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論 文 内 容 の 要 旨

The Concealed Information Test (CIT) is an information-detection technique used in forensic investigations. Previous studies have reported that the CIT is a reliable and powerful method for detecting information. However, the mechanisms underlying the CIT have not been fully elucidated. In particular, hardly any studies have examined effects of emotional arousal at memory encoding on physiological responses in the CIT. In this thesis, I manipulated the magnitude of emotional arousal at memory encoding in various ways and investigated its effects on physiological responses in the CIT. As an index of the detection of concealed information, I measured P300, a component of the event related potential (ERP), in the CIT.

Experiments 1 and 2 were aimed to examine whether emotional arousal at encoding influences P300 in the CIT. For this aim, participants were randomly assigned to either a High Arousal group or a Low Arousal group in both experiments. In Experiment 1, I attempted to manipulate emotional arousal by asking participants to enact different actions in a mock crime task. Participants in the High Arousal group were instructed to stab an “arm of a mannequin” with one sharp-edged tool selected out of five alternatives (e.g., kitchen knife or ice pick) in the mock crime task where participants were asked to harass a mannequin lying on a bed. Participants in the Low Arousal group were instructed to stab a “pillow” in the same experimental setting. After the mock crime task, all participants performed the P300-based CIT. I hypothesized that the High Arousal group would elicit greater P300 in responses to a probe (the picture of the sharp-edged tool used in the mock crime task) than the Low Arousal group. In addition, P300 in response to the probe would be greater than those in response to the irrelevant stimuli (the pictures of the sharp-edged tools that were not used in the mock crime task) in both groups. Results of Experiment 1 showed that there was a significant difference in P300 in response to the probe between the High

and Low Arousal groups. P300 in response to the probe were significantly greater than those in response to the irrelevant stimuli in both groups: the detection of the probe was successful in both groups. Moreover, the differences in P300 between the probe and the irrelevant stimuli were larger in the High Arousal group than in the Low Arousal group: the detection was more efficient in the High Arousal group than in the Low Arousal group.

In Experiment 2, emotional arousal was manipulated before the mock crime task. According to the excitation-transfer theory, arousal can transfer to a temporally close emotion-eliciting event and amplify the intensity of emotional arousal caused by the event. Based on this theory, emotionally arousing pictures were used. Viewing pictures was expected to arouse emotion at a high or a low level for each group respectively. Subsequently, all participants enacted the same mock crime task, in which they were instructed to stab a pillow with the edged tool. After that, the CIT was conducted. The hypothesis was the same as Experiment 1, and results of Experiment 2 were also consistent with those of Experiment 1: participants in the High Arousal group showed significantly greater P300 in response to the probe compared with the Low Arousal group. These results support the idea that emotional arousal influences P300 in the CIT and that emotional arousal enhances the detection efficiency of the CIT.

Although it was shown that emotional arousal plays a specific role in the CIT, mechanisms by which emotional arousal affects the CIT remained unclear. The main purpose of Experiment 3 was to assess how emotional arousal at encoding enhances P300 in the CIT. There were two possibilities here: enhanced P300 would derive either from top-down processing or from bottom-up processing. To elucidate the processing pathway for stimuli encoded with emotional arousal, the subliminal presentation method was applied. Here the same manipulation of emotional arousal and the same mock crime task as Experiment 2 were used. The CIT was conducted under both subliminal and supraliminal conditions. I hypothesized that the results obtained from the supraliminal condition would replicate those reported in Experiments 1 and 2, and the probe would be detected even under the subliminal condition by bottom-up processing. Results revealed a significantly greater difference in P300 between the probe and the irrelevant stimuli in the High Arousal group than in the Low Arousal group under both conditions. Whereas the detection of the probe was successful in both groups under the supraliminal condition, the detection under the subliminal condition was only successful in the High Arousal group. This result showed that the probe associated with high emotional arousal can be automatically processed via the bottom-up route in the CIT.

The present study was the first attempt to investigate the influence of emotional arousal on the CIT using P300 and the first empirical demonstration of effects of emotional arousal at encoding in the CIT. Results from three experiments provide strong evidence that emotional arousal at encoding plays a key role to detect the probe: emotional arousal can enhance P300 in response to the probe in the CIT, and the probe associated with high emotional arousal can be detected without conscious retrieval.