

Emotional Valence Priming Effect Reflected by Event-related Potentials

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Abstract

This study was conducted to investigate whether Stroop-related cognition task will be affected according to the following the emotional priming stimulus. Behavioral response analysis based on RT confirmed that 30ms ISI with masking most primed the target processing in all emotional condition, and the absence of the effect for the 60ms ISI. ERP results performed only in 30ms ISI, prime-target agreement condition reached at N2 peak faster than in the condition showing disagreement between prime and target stimulus. In terms of valence in affective type, negative affect disagree condition shows less positive P300 and earlier peak amplitude than corresponding positive affect typed condition suggesting that negative affect stimulus is automatically inhibited in subliminal level using adequate allocation of attentional resources.

Introduction

The attention-allocation pattern to emotional information in normal, emotionally not disturbed subjects was investigated. Particular attentional patterns to emotional information in normal population were found in several studies, but emotional effect in normal subjects was rare in most researches using emotional Stroop task. Many researchers (e.g., Mathews & MacLeod, 2002) suggested that the strong control of selective attention and task demand processing could easily intercept the input of irrelevant threat-related processing (positive affect) in the condition of direct competition between target-processing and irrelevant threat-related processing.

The present study was to investigate whether the emotional stimuli can affect attentional mechanism related to performing cognitive tasks when presented emotional information separated from target stimuli. This is why the processing target stimuli is not to be in the way of the current upcoming emotional valence. Therefore we can

expect that the emotional distractor can vary the attentional resources according to the valence of given affect.

Methods

This experiment was conducted to elicit a more strong input and processing of irrelevant emotion-related stimulus in normal participants, we primed the emotional stimulus before target stimulus in a Stroop task. Emotional stimuli were composed of positive, negative and neutral affect and inter-stimulus interval were given three types of presentation, 60ms, 30ms, and 30ms with masking.

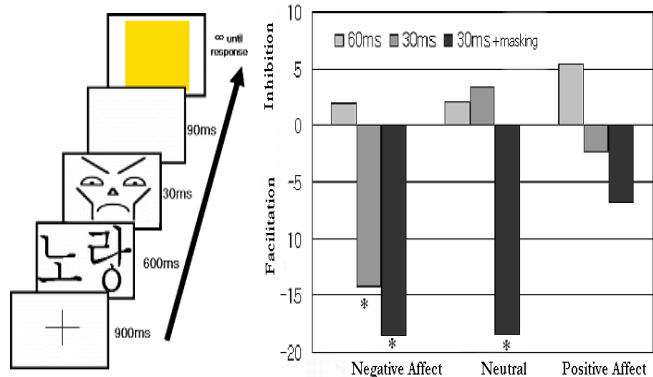


Figure 1: Experimental procedure and behavioral results on response task (* $p < 0.05$, t-test based on test value, 0)

Materials

The stimuli used in this experiment were composed of four types of Stroop array with a combination of positive and negative affect, and agree and disagree. Each stimuli was

presented in a serial stream with Korean color name followed by pre-specified color square.

Procedures

Thirteen healthy right-handed subjects participated in this experiment. Subjects' responses to the task were reduced to two key-press task given according to decision of either 'warm' or 'cold' color of the target stimulus. EEG was acquired to examine the impact of primed emotional stimuli to target processing and to find the brain region responsible for the emotional facilitation and inhibition. The EEG data was recorded from 32 sites on the scalp of the international 10-20 systems mounted on a Quick cap by Brain Vision system (ver. 4.2) at a sampling rate of 250Hz.

Results and Discussion

Preliminary result first has shown that in ISI of 90 ms condition, the priming of positive face slowed down color-naming latency and the priming of negative face accelerated it. Interestingly, this attentional effect expected to be consistent was disappeared when emotional stimulus to negative information was presented for 60 ms, but was persistent when presented for 30ms [$F_{2, 28}=4.5, p<.05$] and masked immediately in same condition [$F_{2, 28}=6.66, p<.01$].

Together with these, in collapsed ERP waveforms at bilateral parietal, especially at P7, N2 component showing mismatch negativity between priming and target stimulus marked more negative peak at around 200ms than the other priming stimuli with significant lower amplitude. P300 component just following the N2 can be seen to allocate attentional resources faster and more adequately. This latency seems to be reflected on accelerating response speed of target. On the other hand, negative potential distribution over left centro-parietal shows the most activation suggesting that negative affect stimulus is likely to recruit this area to facilitate the process of target stimuli. Negative affect priming effect like this is in parallel with the previous study reporting the N170 component related to face information processing (Bentin et al., 1995).

In conclusion, normal subjects could automatically inhibit the emotional processing only when the perceptual code of negative stimulus was weak. Additionally this inhibition increased the speed of processing related to target stimulus by means of redistributing the attentional resources.

Acknowledgments

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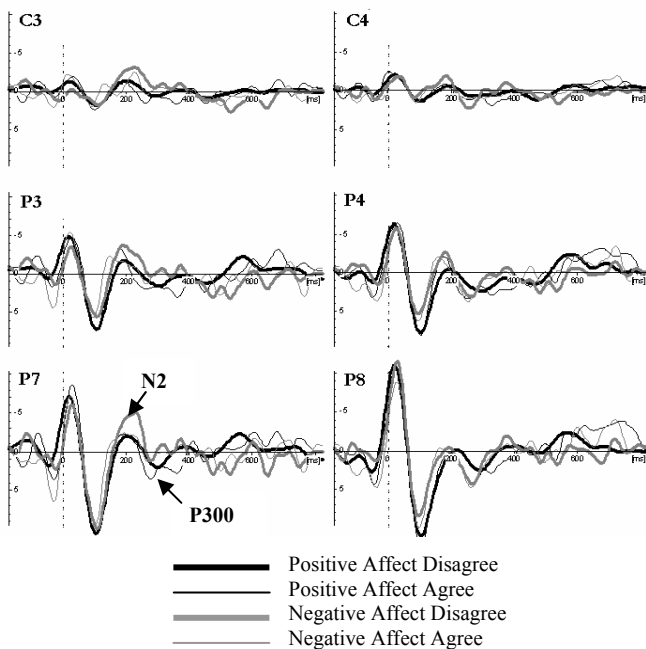


Figure 2: Collapsed waveforms of grand average ERPs over centro-parietal sites.