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Short Communication

Current positive and negative affective states modulate attention: An attentional blink study

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ABSTRACT

The influence of emotion and affect on perception and cognition is now well-documented. For instance, affect has been found to have a direct influence on memory functioning. To investigate whether such effects also extend to the attentional system, we used the "attentional blink" (AB) paradigm. Many studies have documented that the second target (T2) of a pair is typically missed (i.e., less accurately reported) when presented within a time window of about 200–500 ms from the first to-be-detected target (T1; i.e., the AB effect). Using the PANAS, we found in 55 participants that positive affect increases but negative affect decreases the report of the second target. The finding is discussed in relation to a recent theoretical framework of visual attention.

1. Introduction

The influential relation between emotion and attention is now well-established. On the one hand, the affective salience of stimuli may influence the guidance of attention. For instance, humans preferentially detect emotional faces based on visual saliency of specific features (Calvo & Nummenmaa, 2008; Mermillod, Vermeulen, Lundqvist, & Niedenthal, 2009) and, as well, the mere presence of others' fear and disgust facial expressions has been shown to modify perceivers' attentional processes (Stein, Zwickel, Ritter, Kitzmantel, & Schneider, 2009; Vermeulen, Godefroid, & Mermillod, 2009b).

On the other hand, some models propose an influence of participants' affective states on information processing style (Bless & Schwarz, 1999). This theory proposes that negative affect increases the use of a systematic processing style (i.e., analytic processing), whereas positive affect is related to the heuristic use of general knowledge and routines that favor automaticity (Bless & Schwarz, 1999). This model was recently supported by a study showing that negative mood reduced the automatic processing of affective information (Vermeulen, Corneille, & Luminet, 2007). From this standpoint, it can be suggested that individual differences in positive and negative affectivity may naturally alter attentional processes, and not only the way information is processed (i.e., analytic vs. holistic).

The present study used the attentional blink paradigm (AB) to examine the influence of participants' current positive and negative affectivity on attentional processes. In rapid serial visual presentation (RSVP, with up to 19 items per second), AB refers to the negative effect of identification of the first target (T1) on identification of the second target (T2) within a period of 200–500 ms following T1 (Olivers & Meeter, 2008; Potter, Staub, & O'Connor, 2002; Raymond, Shapiro, & Arnell, 1992). The AB paradigm is one of the most widely used paradigms to study the time course of visual attention.

Different theoretical frameworks have been proposed to account for the AB. Some frameworks rely on the idea that AB is caused by attentional capacity limitations or a bottleneck (Potter, Staub, & O'Connor, 2002). Potter, Staub, and O'Connor (2002) have proposed a two-stage competition model of attention. In Stage 1, T1 is detected on the basis of some relevant features (e.g., being a word) and engages attention used to complete its full (lexical) identification. Since it takes 50–100 ms for T1 to be identified, if T2 appears during this stage, it will compete for resources while the two targets are in Stage 1. Because attentional resources are first devoted to the processing of T1, there are insufficient resources remaining to fully process T2, and thus the report of T2 is impaired. This is the typical AB effect. As a result, the target that is first identified (T1) enters Stage 2, where it will be consolidated into short-term memory (STM); this process lasts 200–500 ms. Stage 2 is serial, meaning that it can only process one target at a

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time. An item must pass through Stage 2 in order to be consolidated and reported.

A two-stage bottleneck account, however, cannot easily account for some of the findings in the literature. For instance, it cannot explain why people can read and understand sentences of about 14 words when the sequential presentation rate is about 10–12 words per second (Potter, Kroll, Yachzel, Carpenter, & Sherman, 1986). Similarly, under these conditions, they can also use the sentence's context to select which of two words belongs in the sentence (with each of the two words presented one above the other for 33 ms in the sentence stream; Potter, Stiefbold, & Moryadas, 1998). These findings demonstrate that multiple items can pass through the bottleneck when the presentation flow is not interrupted by distractors, as in the context of a sentence.

A recent theoretical framework proposes that AB is not caused by capacity limitation (Potter, Staub, & O'Connor, 2002) but is a selection deficit (Olivers & Meeter, 2008). This "boost and bounce" (B&B) theory of temporal attention proposes that AB is related to the presence of a gating system that promotes the entrance of relevant information (target-like features) or prevents the entrance of irrelevant information (distractor-like features) into working memory (Olivers & Meeter, 2008). In other words, this model proposes that T2 is often missed (i.e., "blinked") because it follows inhibited distractors.

Based on the boost and bounce model of AB, we hypothesized that current positive and negative affective states might interfere with the AB: positive affectivity should be positively related to T2 reports (i.e., reduced blink) whereas negative affectivity should be negatively related to T2 reports (i.e., increased blink). Indeed, since negative affect favors a systematic processing style (i.e., analytic), a high level of negative affect should relate to increased processing of features. As a result, negative affectivity should enhance inhibition of distractor-like features (as well as the following T2). Conversely, because positive affect favors a holistic processing style, features should be analyzed to a lesser degree, leading to reduced inhibitory responses of distractor-like features (and the following T2 should be reported more efficiently). The current study used both emotional and non emotional stimuli because previous findings showed that affect influences the automatic processing (i.e., meaning access) of emotional information (Vermeulen et al., 2007). If current affective states moderate the way participants allocate attention (i.e., independently of the meaning) then it should influence T2 report regardless of whether T2 are emotional or not.

2. Method

Participants were 55 French speakers (32 females (58.2%); age: $M = 22.29$; $SD = 2.87$) who were tested individually. All had normal or corrected-to-normal vision.

A set of 144 neutral words were selected from previous attentional blink studies (Vermeulen, Mermillod, Godefroid, & Corneille, 2009a; Vermeulen et al., 2009b). These words were not related to emotions (e.g., *ECHO*, *SALT*, *THEORY*, *DEEP*, *PAPER*). All the T1 and one third of the T2 words were selected from this pool of neutral words. We also created two lists of emotion words (low arousal vs. high arousal) that were rated for arousal and subjective language frequency by 20 independent raters who did not participate to the study (10 women; age: $M = 22.85$; $SD = 7.92$). Thirty-six low arousal and 36 high arousal words were selected from a list of 201 rated words. For arousal, judges had to rate each word on a 7-point Likert scale ranging from 1 (Calming, Relaxing, Alleviating) to 7 (Arousing, Exciting, Stimulating).The words were also rated for subjective frequency of use on a 10-point Likert scale ranging from

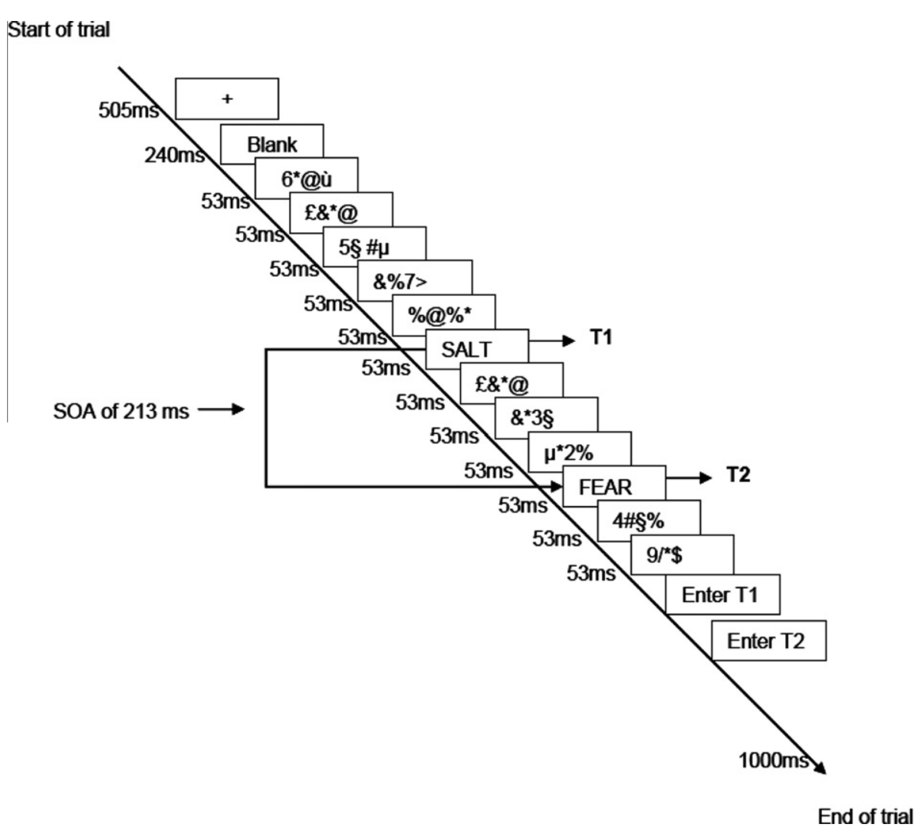

Fig. 1. Schematic overview of typical trials.