

Arousal Level within Negative Affect Influences the Attentional Blink

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Abstract

Negative emotion has been shown to influence attentional performance, though studies have rarely compared different kinds of negative emotion or controlled for arousal levels within emotional states. In an RSVP experiment that varied arousal within negative emotion, it was determined that the experience of sadness (low arousal) and fear (high arousal) resulted in different levels of performance. Following the identification of a negatively valenced target, participants were more sensitive to a second target when experiencing high arousal than when experiencing low arousal.

Introduction

It has been shown that emotion influences attention over time. And that attention is influenced by specific emotional states (Anderson, 2005; Arnell, Killman, & Fijavz, 2007). Previous research has suggested that dysphoria impairs performance on a rapid serial visual presentation task (RSVP, Koster, De Raedt, Verschuere, Tibboel, & De Jong, 2009), whereas anxiety improves performance (Lystad, Rokke, & Stout, 2009). The discrepancy in these results suggests that the influence of emotion on attention is not solely due to valence, rather attention may also be influenced by arousal. (Jeffries, Smilek, Eich, & Enns, 2008).

To test this we used the RSVP paradigm. The RSVP paradigm consists of presenting the participant a rapid "stream" of as many as 19 stimuli. Each stimulus is presented briefly (e.g. 100 ms). In the stream there can be two targets, which are able to be detected because of unique features or identity.

The attentional blink (AB) is a term that describes the typical results of the RSVP paradigm (Raymond, Shapiro, & Arnell, 1992). The AB consists of a reduced ability to detect the second target (T2) when it is presented within 500 ms of attending to the first target (T1).

In this study we predicted that when participants were experiencing negative affect and a high level of arousal they would be more accurate at detecting T2 than when they were in a low state of arousal. T1 was a negatively valenced emotional word, and we also varied the arousal level of T1 to determine whether emotion-congruence would influence the processing of targets.

Methods

Participants

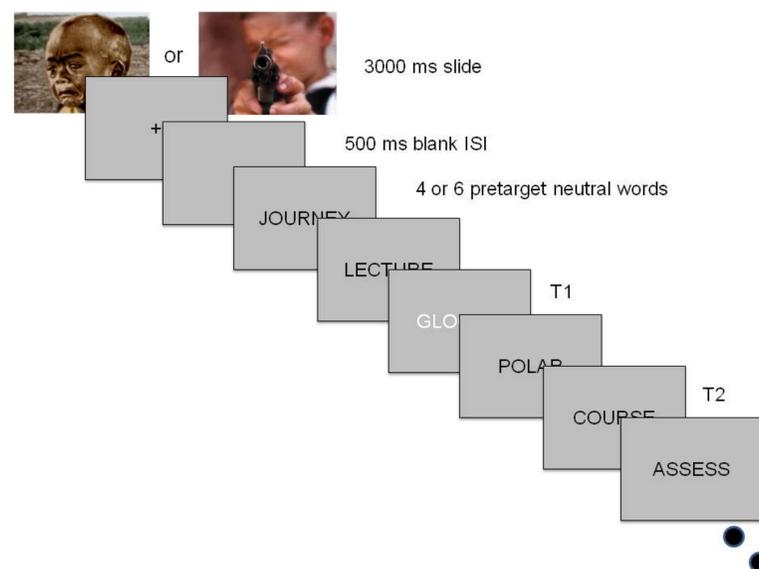
- 30 NDSU undergraduates
- 21 women, 9 men
- Age ranged from 18 to 30 ($M = 19.90$, $SD = 3.09$)
- Participated in exchange for course credit

Procedure

A 2 (arousal of participant: low vs. high) x 2 (arousal of target: low vs. high) x 6 (T2 position) within subjects design was used. A dual-task version of the RSVP paradigm was used, with either a low or high arousal T1 (depending on condition) and a neutral T2. Trial by trial emotions were induced in participants by showing a picture from the IAPS (Bradley & Lang, 1999) immediately prior to the start of each RSVP stream and by playing emotionally relevant music throughout each block of trials. Both pictures and target words were selected for their low mean ratings of pleasure, and varied (low or high) mean ratings of arousal. Participants completed the experiment during two days of testing, with two of the four conditions presented each day.

Each trial consisted of first presenting a black fixation cross for 500 ms in the center of the screen. Following that was a 500 ms blank interval before the start of the RSVP stream. Five or seven neutral distractor words were presented prior to T1, which was always a negatively valenced word and presented in a white font. The word COURSE was presented as T2 at either 100, 200, 300, 400, 600, or 800 ms following T1. Following the RSVP stream the participant was first asked to indicate which of four words was presented as T1. Then the participant was asked to indicate whether or not the word COURSE was present or absent. The next trial began immediately after responding to this question.

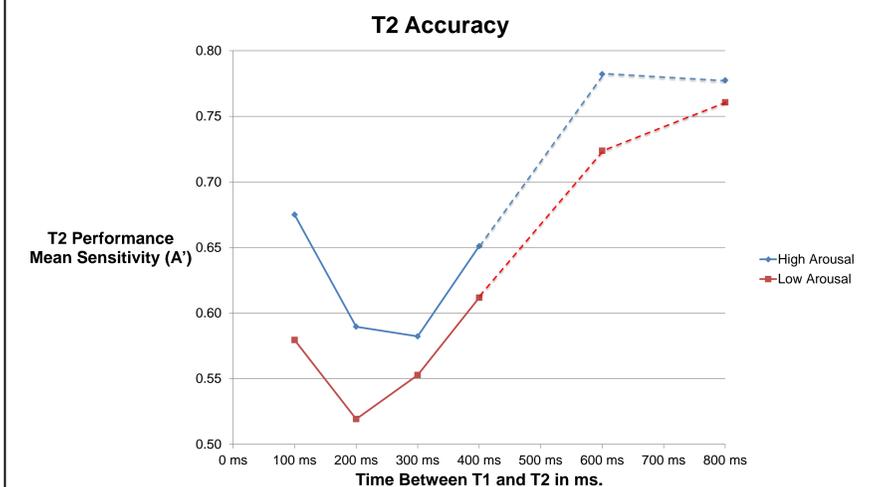
An example of a typical trial experienced by a participant would look like this:



Results

The primary dependent measure in this experiment was accuracy of T2 detection following the accurate identification of T1. A repeated measures ANOVA yielded a main effect for T2 position, $F(5, 145) = 24.90$, $p < 0.001$, indicating the presence of the typical attentional blink. In the first 300 ms T2 detection was less accurate than in the following 500 ms ($t(10) = 3.77$, $p < 0.01$). We also found a main effect for arousal condition, $F(1, 29) = 7.42$, $p = 0.011$. T2 detection was significantly more accurate when participants were in the high arousal condition. There were no significant interactions with the emotional quality of the target.

The graph below demonstrates T2 performance at each position in terms of A' , a nonparametric sensitivity measure.



Conclusions

- Having attended to a stimulus, when experiencing negative affect and high arousal participants can attend to a subsequent stimulus more accurately than when experiencing negative affect with low arousal.
- When experiencing high arousal and negative affect (i.e. fear) processing of negative information occurs quickly, whereas when experiencing low arousal and negative affect (i.e. sadness) processing seems to be slower and less accurate.
- We would suggest that the valence of a stimulus may help us identify what is important, but that arousal determines the efficiency of processing.
- In this case arousal determines the efficiency of processing.

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