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Attentional disengagement is modulated by the offset of unpleasant pictures: a saccadic reaction time study

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ABSTRACT

We studied the influence of passively viewing a picture on saccade latencies to peripheral targets. Thirty-two volunteers were instructed to look at a central picture, wait for the onset of a peripheral target, and execute a saccade toward it as quickly as possible – saccadic reaction time (SRT). The central picture (neutral or unpleasant) could be turned off simultaneously with target onset (the no-gap condition) or 200 ms prior to target onset (the gap-200 condition). We found that saccade latencies were influenced by emotional valence and condition. In the no-gap condition, SRTs were longer after viewing unpleasant pictures. In the gap-200 condition, the pattern was reversed, and unpleasant pictures induced shorter SRTs in relation to neutral pictures. Furthermore, the influence of unpleasant pictures gradually decreased when images were re-exposed to the participants – affective habituation. The results are discussed in terms of attentional avoidance and disengagement from unpleasant emotional pictures.

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1. Introduction

The complex environment in which we live makes distinguishing relevant from irrelevant information necessary. Selective attention limits neural processing to items that are currently relevant to behavior. Controlled (or voluntary) attention is always selecting relevant information in the environment for a fast and accurate processing. However, despite our volitional efforts, some stimuli, due to their intrinsic “salience” are able to draw automatically the attention, creating a tendency to direct our eyes to them. It occurs due to the strong link between the attentional and the eye movement systems (Rizzolatti et al., 1987; Sheliga et al., 1994; Corbetta et al., 1998). In this sense, a considerable number of studies have shown that emotional stimuli are prioritized in perception, and have investigated the mechanisms by which affective

information interferes on the deployment of attention (e.g., Erthal et al., 2005; Pereira et al., 2006, 2010). Behavioral and event-related potential studies have confirmed the link between emotion and attention, the so-called attentional bias of emotional stimuli (Carretié et al., 2001; Öhman et al., 2001; Smith et al., 2003; Calvo and Lang, 2004; Mogg and Bradley, 2006). These studies tested the capability of emotional stimuli to capture/engage attention and attentional dwell time (i.e., the ability to disengage attention from affective stimuli). Some authors found that interference is at least partially attributable to a facilitation of engagement/orienting by affective stimuli (Calvo and Lang, 2004; Mogg and Bradley, 2006; Nummenmaa et al., 2006). Other studies, however, have suggested that attentional bias to emotional stimuli is mainly caused by an increase in attentional dwell time or impaired disengagement from affective stimuli (Fox et al., 2001, 2002). Finally, some studies have found that both mechanisms occur and contribute to attentional bias, i.e., the vigilance-avoidance pattern (Koster et al., 2005, 2006; Pflugshaupt et al., 2005; Rinck and Becker, 2006; for a recent review, see Cisler and Koster, 2010).

Despite the strong link between attention and eye movement, only more recently some authors introduced eye movements as a tool to assess the relationship between attention and emotion. Calvo and Lang (2004) and Nummenmaa et al. (2006) showed that emotional pictures capture overt visual attention. Under free-viewing conditions, the probability of first saccades and gaze duration were higher for

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