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Effects of positive pictograms and words: An emotional word superiority effect?

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ABSTRACT

Studies comparing verbal and pictorial stimuli with emotional content often revealed a picture advantage in terms of larger or more pronounced emotional valence effects evoked by pictorial stimuli. This picture advantage usually is accounted for by their heightened biological relevance compared to symbolic word stimuli. However, physical differences in terms of number of features and discriminability between lexical and pictorial stimuli might also account for this pattern.

The present study used event-related potentials (ERPs) to examine the hypothesis that the picture advantage is associated with the pictures' heightened complexity compared to words. In a valence judgment task participants assessed the emotional impact of positive and neutral words and pictograms. It was expected that the differences in the emotion effects for these two types of stimulus modalities were diminished, as a result of the reduced complexity of the pictograms.

The results show that both types of stimuli elicited significant and comparable positive-going emotional valence effects around 240–300 ms post-stimulus. However, around 340 ms after stimulus onset the valence effects evoked by pictograms were restricted to

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posterior regions and smaller in magnitude whereas those evoked by words were characterized by a larger and more widespread scalp distribution, possibly due to their heightened potential to exalt imagination. Furthermore, amplitudes in the late time windows evoked by pictograms over posterior regions were significantly more positive than ERP amplitudes evoked by words, suggesting that the processing of pictograms requires cognitive capacity and effort to a much greater extent than the processing of words. In conclusion, the previously reported picture superiority in emotion elicitation was not replicated using pictograms, suggesting that it can at least partially be explained by the pictures' heightened complexity and spatial distinctiveness.

1. Introduction

A number of studies consistently observed superior processing of positive and negative compared to neutral information – with different types of affective material and across different paradigms. For example, an emotion advantage was found in recognition memory studies using pictures (Bradley, Greenwald, Petry, & Lang, 1992; Ochsner, 2000) or words (Kuchinke et al., 2006), in word recognition (Kissler, Herbert, Peyk, & Junghöfer, 2007; Kuchinke, Võ, Hofmann, & Jacobs, 2007) and picture processing (Schupp et al., 2000). The advantage of affective information is usually accounted for by a higher distinctiveness of emotional material (Kensinger & Corkin, 2003; Ochsner, 2000) and its ability to focus attention and elicit sustained processing (Citron, 2012).

Using event-related potentials (ERPs), emotionally positive or negative stimuli were found to elicit an increased late positive potential (LPP) compared to neutral stimuli (Cuthbert, Schupp, Bradley, Birbaumer, & Lang, 2000; Fischler & Bradley, 2006; Herbert, Kissler, Junghöfer, Peyk, & Rockstroh, 2006), peaking between 500 and 800 ms after stimulus onset with a centro-parietal scalp distribution. The LPP has been attributed to sustained processing of emotional stimuli (Citron, 2012) and, according to Schupp et al. (2000) this positive-going shift is caused by the enhanced motivational significance of emotional compared to neutral stimuli. In processing verbal materials, an advantage of positive words over negative and neutral words is also often reported (Citron, 2012; Herbert et al., 2006).

In both, verbal and pictorial processing, a second ERP component modulated by the emotionality of the stimuli is consistently reported: the early posterior negativity (EPN). The EPN has a temporal–occipital scalp distribution and peaks around 250 ms after stimulus presentation (Citron, 2012; Kissler et al., 2007; Schupp, Junghöfer, Weike, & Hamm, 2004). The EPN reflects the allocation of attention towards salient, attention-capturing emotional stimuli (Junghöfer, Bradley, Elbert, & Lang, 2001; Schupp et al., 2004). It is discussed that this attentional orientation is triggered automatically by emotional stimuli (Citron, 2012). Some studies report a different effect in the same time window with an opposite positive polarity, an enhanced P300 to emotional target stimuli, peaking around 300 ms post-stimulus with a more central–posterior distribution (Citron, 2012; Fischler & Bradley, 2006; Hajcak, MacNamara, & Olvet, 2010). The P300 is visible in tasks that require the participants to evaluate or memorize the presented stimuli (e.g. Herbert et al., 2006). Thus, the P300 is discussed to mirror focal, controlled attention during stimulus evaluation in order to respond to the task requirements (Polich, 2007), in case of emotional stimuli again triggered by their higher motivational salience compared to neutral ones (Hajcak et al., 2010).

That the different types of materials have been found to elicit comparable emotional effects in ERPs is somewhat surprising given that the discussion of the differences between the processing of words and pictures has a long tradition in cognitive psychology. Basically, this distinction has been attributed to hemispheric differences observed in picture and word processing. A common finding is that visually presented words are initially processed in the language-dominant left hemisphere, whereas picture processing originates in the right hemisphere (Pegna, Khateb, Michel, & Landis, 2004; Sevostianov,