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When language gets emotional: Irony and the embodiment of affect in discourse

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ABSTRACT

Although there is increasing evidence to suggest that language is grounded in perception and action, the relationship between language and emotion is less well understood. We investigate the grounding of language in emotion using a novel approach that examines the relationship between the comprehension of a written discourse and the performance of affect-related motor actions (hand movements towards and away from the body). Results indicate that positively and negatively valenced words presented in context influence motor responses (Experiment 1), whilst valenced words presented in isolation do not (Experiment 3). Furthermore, whether discourse context indicates that an utterance should be interpreted literally or ironically can influence motor responding, suggesting that the grounding of language in emotional states can be influenced by discourse-level factors (Experiment 2). In addition, the finding of affect-related motor responses to certain forms of ironic language, but not to non-ironic control sentences, suggests that phrasing a message ironically may influence the emotional response that is elicited.

1. Introduction

Despite the fact that intuitively, language can evoke strong emotional responses in the reader or listener, the relationship between language and emotion is poorly understood. Recent theoretical developments in grounded cognition (see e.g., Barsalou, 2010, for a review) provide a framework in which this relationship can be investigated. When applied to language, these theories claim that neural systems involved in non-linguistic activities such as perception, action, and emotion are utilised during language comprehension. Specifically, it is assumed that the same modality-specific (sensorimotor) representations that are activated whilst interacting with the environment are re-enacted or 'simulated' when reading about a similar experience (e.g., Barsalou, 1999, 2008; Crocker, Knoeferle, & Mayberry, 2010; Fischer & Zwaan, 2008; Glenberg, 2008; Glenberg & Gallese, 2012; Glenberg & Robertson, 2000; Zwaan, 2004). In the current paper, we investigate the grounding of language in emotion simulation, using a novel approach that examines the relationship between the reading and comprehension of a written discourse and the performance of affect-related motor actions.

There is increasing evidence to suggest that language-induced simulations play a vital role in text comprehension, particularly with respect to action and perception. For instance, it has been demonstrated that semantic sensibility judgements for action phrases such as *aim a dart* (Klatzky, Pellegrino, McCloskey, & Doherty, 1989), *close the drawer* (Glenberg & Kaschak, 2002), and *turn down the volume* (Zwaan & Taylor, 2006; see also Taylor, Lev-Ari, & Zwaan, 2008; Zwaan, Taylor, & de Boer, 2010) are produced faster if the motor response to make the judgement matches the movement direction implied by the phrase (e.g., turning a dial anti-clockwise as opposed to clockwise when judging the phrase *Eric turned down the volume*). These studies suggest that comprehending action-based language can influence the performance of related actions. Interestingly, other work has shown that performing certain actions can also influence language comprehension (Glenberg, Sato, & Cattaneo, 2008).

Similar findings have been obtained with respect to sentences that may evoke perceptual simulations (imagery). For example, after reading a sentence like *The ranger saw the eagle in the sky*, participants are faster to recognise a picture of an eagle with extended wings than with folded wings, suggesting that reading the sentence resulted in a perceptual representation of an eagle in flight (Zwaan, Stanfield, & Yaxley, 2002; see also Kaschak et al., 2005; Kaup, Yaxley, Madden, Zwaan, & Lüdtke, 2007; Solomon & Barsalou, 2004; Vandeberg, Eerland, & Zwaan, 2012; Yaxley & Zwaan, 2007; Zwaan & Pecher, 2012; Zwaan & Yaxley, 2004). Recent research also suggests that prior exposure to an object in a particular orientation which mismatches

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with the orientation implied in a subsequently presented sentence can produce disruption to reading as evidenced in both eye-tracking (Wassenburg & Zwaan, 2010) and event-related brain potentials (Coppens, Gootjes, & Zwaan, 2012). Functional neuroimaging findings also point to the contribution of both perceptual and action-related simulations during language comprehension (e.g., Boulenger, Hauk, & Pulvermüller, 2009; Raposo, Moss, Stamatakis, & Tyler, 2009; Speer, Reynolds, Swallow, & Zacks, 2009).

In contrast, the role of emotional simulation during language comprehension is less well understood (see Glenberg, Webster, Mouilso, Havas, & Lindeman, 2009, for a review). In particular, although we typically encounter words in context rather than in isolation, very little is known about language-induced simulations of emotion in sentence and discourse comprehension as compared to single words. To our knowledge, so far only Havas, Glenberg, and Rinck (2007) have investigated the embodied conceptualisation of affective content in *sentence* comprehension versus isolated words (see Chwilla, Virgilito, & Vissers, 2011, for mood-related influences on comprehension). Havas et al. (2007) report that covert manipulation of emotional facial posture (either an induced smile or an induced pout; cf. Strack, Martin, & Stepper, 1988) interacts with sentence valence when measuring both the amount of time to judge the emotional valence of a sentence (Experiment 1), and to judge whether the sentence is easy to understand, a task unrelated to emotion (Experiment 2). In each case, judgement times were faster when facial posture and sentence valence matched than when they mismatched (see also Havas, Glenberg, Gutowski, Lucarelli, & Davidson, 2010, for related evidence that sentence reading times for sad and angry sentences, but not happy sentences, are influenced by injection of Botulinum Toxin A into muscles that control frowning). Since Havas et al. (2007) found that facial posture did not influence RT to valenced words that were presented in isolation in a lexical decision task (Experiment 3), it seems unlikely that facial postures merely prime specific positively or negatively valenced words in the semantic memory system, thereby producing the observed RT effects. In light of their contrasting findings for isolated words, Havas et al. proposed that "simulation using emotional systems is predominantly a sentence- or phrase-level phenomenon" (p. 439). More specifically, in accord with the indexical hypothesis (Glenberg & Robertson, 1999), they assume that text comprehension and the processing of valenced words use simulations in the emotion system. It is fair to mention though that Havas et al. do not strictly exclude word-based simulation effects, arguing that these might be present for "words that directly name emotions (e.g. happy)" (p. 439) or for motor variables different from facial posture (e.g., approach–avoidance movements, to be discussed below). It is also possible that the tasks employed by Havas et al. in Experiment 1 (judging whether sentences described pleasant or unpleasant events) and 2 (judging whether sentences were easy or hard to understand) demanded a deeper level of semantic (conceptual and affective) processing than lexical decisions, and hence, differential task demands might have contributed to Havas et al.'s discrepant findings for affective words presented in isolation versus in a sentence context.

Other studies have also suggested that the observation of effects which could be attributed to the grounding of affect in motor actions may be task-dependent (e.g., Bamford & Ward, 2008; Van Dantzig, Pecher, & Zwaan, 2008; Wentura, Rothermund, & Bak, 2000). For example, Niedenthal (2007; see also Niedenthal, Winkielman, Mondillon, & Vermeulen, 2009) reported a study in which participants had to make affective or non-affective judgements about single words. Isolated valenced words generated emotion-specific facial activation as measured by electromyogram (EMG) recordings only in the emotion-related task (e.g., muscles involved in smiling were activated when reading joyful words). When participants had to perform an emotion-unrelated task, by judging whether the words were printed in upper or lower case, no such EMG effects were observed, suggesting that valenced words do not automatically prime associated facial expressions. According to Niedenthal (2007; Niedenthal et al., 2009), their findings support the view of task-dependent simulations in the emotion system, that is, emotional simulations are only recruited if they are required in order to perform the specific task.

In contrast, some studies have provided evidence in support of an *automatic* link between emotion evaluation and specific motor actions when the valence of the stimuli was task-irrelevant, as summarised in Table 1. Following a gradual, feature-based definition of automaticity (cf. Moors & De Houwer, 2006), the term "automatic" is used in the present paper to refer to a fast-operating process that is independent from evaluation goals (cf. Krieglmeyer, De Houwer, & Deutsch, 2013). Initial evidence for a relationship between isolated positively or negatively valenced words and particular muscle actions was obtained in studies that employed an *affect–movement compatibility task* (e.g., Chen & Bargh, 1999; Neumann, Hess, Schulz, & Alpers, 2005; Solarz, 1960). For example, Chen and Bargh (1999, Experiment 2) instructed participants to push or pull a lever as soon as they detected the presence of a word on the screen. Even though the task was unrelated to the emotional nature of the stimuli, participants were faster to pull the lever towards themselves for positive words and to push for negative words. In light of these findings, Chen and Bargh (1999) argued that positive and negative stimuli are automatically evaluated and linked in a fixed manner to specific approach–avoidance actions. That is, according to this muscle-specific motivational view, positive emotional stimuli automatically activate 'approach' tendencies, thus facilitating hand movements towards the participant's body (flexions), and negative emotional stimuli activate 'avoid' tendencies, thus facilitating hand movements away from the body (extensions) (e.g., Lang, 1995).

However, both the extent and nature of such automatic approach–avoidance tendencies have been debated recently (for a review, see Krieglmeyer et al., 2013). As pointed out by Rotteveel and Phaf (2004), the low demands of the detection task might have allowed participants to evaluate stimulus valence. As a result, the affect–movement compatibility effects observed by Chen and Bargh (1999, Experiment 2) might reflect a non-automatic rather than an automatic effect. In support of this possibility, Rotteveel and Phaf (2004) failed to observe an affect–movement compatibility effect when participants judged, by making up (flexion) or down (extension) arm movements, a non-affective stimulus dimension (gender) of faces displaying happy versus angry expressions. In contrast, the effect was clearly present when the task was to evaluate whether the facial expression was either happy or angry. These findings led Rotteveel and Phaf to assume that muscle-specific action tendencies (flexion vs. extension) depend on the conscious appraisal of affective stimuli.

However, it should be noted that Rotteveel and Phaf did not use linguistic stimuli, nor did their arm movements involve a change in the distance between self and affective stimulus that characterises approach–avoidance movements (e.g., Markman & Brendl, 2005). Also in contrast to the arguments of Rotteveel and Phaf, more recent two-choice RT studies (Krieglmeyer, Deutsch, De Houwer, & de Raedt, 2010) showed an affect–movement compatibility effect for positively and negatively valenced words when participants performed (distance-changing and goal-independent) approach–avoidance responses based on a non-affective stimulus feature (e.g., grammatical word category).

In summary, affect-related motor embodiment effects have been clearly demonstrated for the processing of isolated valenced words when the task itself is emotion-related, whereas evidence in favour of such effects is somewhat mixed when evaluation of the emotional content of the target word is not required (cf. Table 1). It is difficult to point to a single factor that would explain this inconsistency in findings, specifically, as the reviewed studies differ with respect to tasks, materials, and response conditions. It is further evident from Table 1 that the processing of valenced words in context has received little attention so far, which is surprising given the fact that emotion simulation is assumed to be contextualised. In this respect, the Havas et al. (2007) study is exceptional in that they demonstrated that facial posture influences emotion comprehension for words presented in a sentence context, but not for