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Effects of affective and emotional congruency on facial expression processing under different task demands

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ABSTRACT

Contextual influences on responses to facial expressions of emotion were studied using a context-target paradigm that allowed distinguishing the effects of affective congruency (context and target of same/different valence: positive or negative) and emotional congruency (context and target representing the same/different emotion: anger, fear, happiness). Sentences describing anger, fear or happiness-inducing events and faces expressing each of these emotions were used as contexts and targets, respectively. While between-valence comparisons (context and target of similar/different valence) revealed affective congruency effects, within-valence comparisons (context and target of similar valence and same/different emotion) revealed emotional congruency effects. In Experiment 1 no evidence of emotional congruency and limited evidence of affective congruency were found with an evaluative task. In Experiment 2 effects of both affective and emotional congruency were observed with an emotion recognition task. In this case, angry and fearful faces were recognized faster in emotionally congruent contexts. In Experiment 3 the participants were asked explicitly to judge the emotional congruency of the target faces. Emotional congruency effects were again found, with faster judgments of angry and fearful faces in the corresponding emotional contexts. Moreover, judgments of angry expressions were faster and more accurate in happy than in anger contexts. Thus, participants found easier to decide that angry faces did not match a happy context than to judge that they did match an anger context. These results suggest that there are differences in the way that facial expressions of positive and negative emotions are discriminated and integrated with their contexts. Specifically, compared to positive expressions, contextual integration of negative expressions seems to require a double check of the valence and the specific emotion category of the expression and the context.

1. Introduction

Recent research has shown that processing of facial expressions of emotion is modulated by the context in which they are perceived (see Wieser & Brosch, 2012, for a review). Modulation occurs when recognition of the expression is facilitated or impaired depending on its congruency with the context (e.g., Diéguez-Risco, Aguado, Albert, & Hinojosa, 2013; Righart & de Gelder, 2008a) or when contextual information disambiguates an ambiguous expression (e.g., Kim et al., 2004). We focus here on the situational context in which facial expressions are perceived, that is, the physical or social environment in which the face showing a given expression is embedded. Operationally, manipulation of situational contexts has involved presenting a face along with a pictorial or verbal description of the related situation. Emotion recognition is more efficient when the expression and the context are congruent (e.g., fearful face/threat context) than when they are incongruent (e.g., fearful face/happy context). For example, in a study by Righart and de Gelder (2008a) happy, fearful or disgusted faces were presented superimposed on pictures representing different scenes. Faster recognition of target expressions was observed in those trials in which the expression was congruent with the context. Similar results have been reported in other studies with either pictorial or verbal contexts (Diéguez-Risco, Aguado, Albert, & Hinojosa, 2015; Diéguez-Risco et al., 2013; Hietanen & Astikainen, 2013; Righart & de Gelder, 2008b).

1.1. Affective congruency and emotional congruency

When speaking of contextual congruency it is important to be precise about its meaning. A specific context-target combination, for

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example a sad face presented on the background of an anger scene, can be said to be affectively congruent because both the expression and the context have negative valence. This would be an example of affective congruency. On the other hand, this same combination can be said to be emotionally incongruent in the sense that the expression and the context represent different specific emotions, sadness and anger, respectively. Thus, the expression of sadness is at the same time affectively congruent and emotionally incongruent with the context. Discriminating the effects of affective and emotional congruency requires a design including stimuli related to one positive emotion (happiness) and at least two negative emotions (e.g., fear and anger). The comparison between affectively congruent and incongruent trials (between-valence effects) would reveal the effects of affective congruency. On the other hand, the comparison between trials that are affectively congruent but emotionally incongruent (within-valence effects) should reveal the effects of emotional congruency. Although a similar design has been used in some studies (Dozolme, Brunet-Gouet, Passerieux, & Amorim, 2015; Righart & de Gelder, 2008a) the relative influence of affective and emotional congruency was not explicitly considered. For example, Dozolme et al. used target faces expressing sadness, joy, fear or anger, that were presented after the participant had read a sentence describing joy-, fear- or anger-inducing situations. However, affective and emotional congruencies were confounded in the analysis given that the data were averaged based only on affective congruency.

The distinction between affective and emotional congruency is closely related to the contrasting dimensional and categorical approaches to the study of emotion. Affective congruency fits well with the dimensional approach that considers emotions as varying along two general dimensions of valence and arousal (e.g., Bradley, 2000). On the other hand, emotional congruency fits better with a characterization of affect in terms of specific emotional categories as proposed by the discrete or basic emotion theories (e.g., Ekman, 1992; Izard, 1993). Based on these theories, affective stimuli would be also processed and differentiated in terms of their specific thematic content (e.g., threat-related vs loss-related). In fact, empirical evidence suggest that the dimensional and categorical approaches to emotion are complementary as they capture fundamental features and components of emotional phenomena at the behavioral, psychophysiological, experiential and brain systems levels. For example, although some psychophysiological responses show differential sensitivity to variations in the dimensions of valence and arousal (e.g., Bradley, 2000), changes in expressive behavior including body posture, facial expression and voice intonation are instead associated to different specific emotional states (e.g. Dael, Mortillaro, & Scherer, 2012; Matsumoto, Keltner, Shiota, O'Sullivan, & Frank, 2008). Taking facial expression as a main example of expressive behavior our main question here refers to the extent to which affective and emotional congruency influence contextual integration of facial expressions of emotion.

1.2. Emotional congruency: previous evidence

While there is much experimental evidence on the influence of affective congruency on the processing of affective stimuli, the role of emotional congruency has received less attention. Some studies have considered the effects of the context provided by expressive body postures on the categorization of facial expressions (e.g., Aviezer et al., 2008; Aviezer, Trope, & Todorov, 2012) showing that both valence attribution and emotion categorization are highly malleable and sensitive to contextual influences. There is also evidence that the social context in which facial expressions are perceived modulates emotion recognition. This was the conclusion of a study by Mumenthaler and Sander (2015) in which recognition of fearful faces was improved and recognition of blended fear/surprise expressions biased by concurrent, subliminally presented faces showing angry expressions or gazing directly at the observer. The results of these studies suggest that both the valence and the specific emotional meaning of the context modulate perception of facial expressions of emotion. In a different vein, Carroll and Young (2005) have shown categorical priming effects using different combinations of stimuli as primes and targets (e.g., words and faces). In Experiments 2 and 3 it was found that facial expressions of different basic emotions were recognized faster in related trials (same emotion for prime and target) than in unrelated ones (different emotion for prime and target). However, the interpretation of this result is complicated by the fact that the analyses were based on the averages of all trials of the related or the unrelated conditions, leading to a potential confound of valence and emotion category effects. Acknowledging this possibility, the authors reanalyzed their results removing all trials with positive targets. Although priming of facial expressions by auditory primes (Experiment 3) survived this analysis, priming by affective pictures (Experiment 2) was significantly reduced. A further possibility not considered by the authors but that might also complicate interpretations based on data averaged over trials with positive and negative targets is that congruency based on emotion categories of different valence might not have uniform effects. One of the main goals of the present study was precisely to investigate the possibility that the mechanisms involved in the computation of the contextual congruency of facial expressions differ between emotions of positive and negative valence. In the following section we delineate the reasons why this possibility should be explicitly considered when studying the effects of affective and emotional congruency.

1.3. Congruency effects with positive and negative emotions

Although qualitative differences between different positive emotions in terms of experience and appraisal have been described (e.g., Cohn & Fredrickson, 2009; Cohn, Fredrickson, Brown, Mikels, & Conway, 2009; Morrone-Strupinsky & Lane, 2007), a smiling face is the common expressive hallmark of all of them. Because of this, affective and emotional congruencies are coincident in the case of smiling target faces (a happy face “goes” with any positive context but does not go with any negative context). In contrast to this, the fact that there are different configurations of facial movements corresponding to different negative emotions may make the computation of congruency more difficult in the case of negative targets. Affective and emotional congruency will be not coincident on trials in which the context and the target are both negative but represent different specific emotions (e.g., a sad face presented on an anger context). In this case, computing the congruency between expression and context will require a double check of affective and emotional meaning (see Aguado, Dieguez-Risco, Méndez-Bértolo, Pozo, & Hinojosa, 2013, for an application of this interpretation in the context of an affective priming procedure). It can thus be predicted that congruency effects that go beyond affective valence should be found in the case of negative expressions. More specifically, within-valence congruency effects would be expected when the context and the target represent different negative emotions. Moreover, between-valence congruency effects on trials in which the target and the context have different valence might go in the opposite direction to that usually seen in affective priming studies. For example, responses to negative targets on affectively incongruent trials should be faster than on affectively congruent trials. This would be because responses to the target in affectively incongruent trials only require a valence check. In contrast, a double check of valence and emotion would be needed in trials with negative contexts and targets.

1.4. The effect of task demands

A second goal of our study was to assess the role of task demands in modulating the relative influence of affective and emotional congruency. Context and priming studies with facial expression targets have assigned the participants tasks that do not require explicit attention to the relationship between the target and its context. Most usually,