# The integration of visual context information in facial emotion recognition in 5- to 15-year-olds

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### A B S T R A C T

The current study investigated the role of congruent visual context information in the recognition of facial emotional expression in 190 participants from 5 to 15 years of age. Children performed a matching task that presented pictures with different facial emotional expressions (anger, disgust, happiness, fear, and sadness) in two conditions: with and without a visual context. The results showed that emotions presented with visual context information were recognized more accurately than those presented in the absence of visual context. The context effect remained steady with age but varied according to the emotion presented and the gender of participants. The findings demonstrated for the first time that children from the age of 5 years are able to integrate facial expression and visual context information, and this integration improves facial emotion recognition.

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## Introduction

The recognition of basic facial expressions of emotion (e.g., joy, sadness, anger, fear) is crucial for the development of emotion understanding and successful social interaction (Matsumoto, Keltner,

Shiota, O'Sullivan, & Frank, 2008). In daily life, facial emotional expressions are experienced mainly in contextualized situations, but the developmental time course of emotional face–context integration remains unclear. The current study focused on the issue of whether and when visual context information starts to play a role in the visual recognition of basic emotions.

The ability to recognize facial expressions emerges early with infants' capacities to discriminate between facial expressions at around the age of 7 months (for a review, see Bayet, Pascalis, & Gentaz, 2014). These early recognition abilities improve considerably with age throughout childhood and (pre)adolescence (for a review, see Gosselin, 2005). According to the dimensional view (Russell, 1997), children begin by classifying facial expressions into two broad categories on the basis of the positive and negative dimensions of valence and arousal before categorizing them into specific emotional categories as adults do. In contrast, according to the discrete category assumption (Ekman, 1992; Izard, 1991), very young infants already recognize and respond to different specific emotions conveyed via facial expressions.

To understand the development of facial expression recognition during childhood, researchers have designed different tasks (e.g., free labeling of facial expressions, facial expression matching, forced choice between multiple emotion labels for a single expression item; Markham & Adams, 1992; Vicari, Reilly, Pasqualetti, Vizzotto, & Caltagirone, 2000). Taken together, the results of such studies provide a general consensus regarding the developmental trajectory of facial expression recognition: Overall, kindergarten children (4 and 5 years old) performed as well as grade school children (6–9 years old) for happiness, but they performed significantly worse for (in ascending order of difficulty) sadness, anger, and fear (Boyatzis, Chazan, & Ting, 1993; Camras & Allison, 1985; Widen & Russell, 2008b). The recognition of surprise and disgust seems to develop later, between 6 and 10 years of age (Widen & Russell, 2013). This consensus is challenged, however, by the variety of experimental procedures used by researchers for assessing the ability to recognize facial expression. Indeed, methodological choices may influence experimental settings by either favoring or precluding the use of certain cues, and the importance of these cues can vary as a function of children's age and the type of emotion being recognized. For instance, the emotion labeling performance of 3-year-olds was lower when they were shown a facial expression than when they were given the cause or consequence of an emotion (Balconi & Carrera, 2007; Widen & Russell, 2004, 2010). This *face inferiority effect* was particularly strong for fear and disgust (Camras & Allison, 1985; Widen & Russell, 2004), two later-emerging emotions, and remained strong from childhood to early adulthood (Widen, Pochedly, & Russell, 2015). In addition, children as young as 6 years understand that facial expressions are sometimes produced according to display rules to mask embarrassing emotions or to simulate emotions in order to obtain social reactions from interlocutors, for instance, and that facial expression might not systematically reflect actual emotional states (Saarni, 1979). These results suggest that the strongest cues to categorize emotion may change as children's understanding of emotion increases.

In real-life situations, one rarely encounters faces in an isolated fashion; facial expressions are generally experienced within a context that influences the interpretation of these expressions. Researchers who consider facial expressions as discrete categories have minimized the role of context in emotion perception, suggesting that basic facial expressions are unambiguous signals that should be read from the face configuration regardless of the context in which it appears (e.g., Ekman, Friesen, & Ellsworth, 2013; Ekman & O'Sullivan, 1988). However, more recent studies suggest that facial expressions include features that convey both unambiguous and ambiguous information. Indeed, whereas certain features of an expression (i.e., activation of specific facial muscles) might be relatively unique to it (e.g., wrinkled nose in disgust), other features (e.g., furrowed brows) are shared with other expressions (Smith, Cottrell, Gosselin, & Schyns, 2005). Computerized analysis of physical similarities between facial expressions and human errors (Susskind, Littlewort, Bartlett, Movellan, & Anderson, 2007) showed that facial expressions are ambiguous to varying degrees with other facial expressions with which they share physical features. For example, expressions of disgust were classified as being most similar to those of anger, as less similar to sad faces, and as even less similar to fear faces.

Because facial expressions can be considered ambiguous, some studies investigated the role of context information in the processing of facial expressions in adults. These studies reported that