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Children's visual attention to emotional expressions varies with stimulus movement

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ABSTRACT

The majority of studies of emotion perception have relied on static isolated facial expressions. These expressions differ markedly from real-world expressions that include movement and multiple cues (e.g., bodies), leaving our understanding of how expression perception develops incomplete. We examined the looking patterns of younger children (4- and 5-year-olds), older children (8- and 9-year-olds), and adults while watching dynamic video clips or static images of four different emotional expressions: happiness, sadness, anger, and fear. Expressions were presented in three conditions: face only, body only, and whole person (face and body). Children's and adults' looking patterns were affected by whether stimuli were static or dynamic and by which cues were available. Children looked to the head less for static stimuli than for dynamic stimuli, but this difference did not emerge for adults. Children and adults attended to different expression cues when presented with static images. These results demonstrate the need for increased use of dynamic stimuli in developmental studies of expression.

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Introduction

Recognizing others' emotions is critical for successful social interactions and for making appropriate responses to our environment. The perception of sadness may evoke attempts to comfort, whereas

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the perception of fear or anger may evoke withdrawal. In daily life, expressions are dynamic and nearly always accompanied by other emotion cues (e.g., body posture, contextual information). However, most studies investigating emotion perception have presented participants with static facial expressions isolated from other emotion cues, such as posture, and devoid of movement or context (Aviezer, Trope, & Todorov, 2012; Boyatzis, Chazan, & Ting, 1993; Camras & Allison, 1985; Durand, Gallay, Seigneure, Robichon, & Baudouin, 2007; Gao & Maurer, 2009; Kolb, Wilson, & Taylor, 1992; Krumhuber, Kappas, & Manstead, 2013; Mondloch, Nelson, & Horner, 2013; Vicari, Reilly, Pasqualetti, Vizzotto, & Caltagirone, 2000; Widen & Russell, 2003, 2008).

Recent research with adult participants has demonstrated the need to use stimuli that more closely resemble the expressions we see on a daily basis, particularly expressions that are dynamic and include several cues to emotion, such as facial and postural expressions. The argument for using dynamic stimuli stems from research suggesting that adults' recognition of isolated facial expressions increases when facial expressions are presented dynamically as compared with statically, particularly when the expressions are subtle or degraded (reviewed in Krumhuber et al., 2013). The benefits of dynamic expressions stem from the facial movement itself rather than the additional visual information that is present in a dynamic expression; the benefits decrease when the movement of the face is disrupted by embedding a mask of visual noise between subsequent frames of the video clip (Ambadar, Schooler, & Cohn, 2005; Bould & Morris, 2008).

The argument for using multi-cue stimuli comes from evidence that adults recognize emotion in a variety of nonfacial cues to emotion, including postural expressions, and that postural expressions influence perception of facial expressions (de Gelder, 2006, 2009; de Meijer, 1989; Hadjikhani & de Gelder, 2003; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979; Schindler, Van Gool, & de Gelder, 2008; Sinke, Kret, & de Gelder, 2012; Wallbot, 1998). Accuracy increases when posture is congruent with the facial expression (van de Riet & de Gelder, 2008; Van den Stock, Righart, & de Gelder, 2007) and decreases when the posture is incongruent (e.g., sad face on a fearful body) even when participants are instructed to ignore the postural information (Aviezer, Hassin, Bentin, & Trope, 2008; Aviezer, Hassin, Ryan, et al., 2008; Aviezer et al., 2012; de Gelder & Van den Stock, 2011; Meeren, van Heijnsbergen, & de Gelder, 2005; Mondloch et al., 2013; Righart & de Gelder, 2008a; Righart & de Gelder, 2008b; reviewed in de Gelder, 2006). These findings suggest that both facial information and postural information are integral to interpreting emotional expressions.

Despite mounting evidence that dynamic multi-cue expressions facilitate adults' perception of emotional stimuli, most studies investigating children's expression perception have focused on their understanding of static, isolated facial expressions (Back, Ropar, & Mitchell, 2007; Lindner & Rosen, 2006; Nelson & Russell, 2011a, 2011b; Vieillard & Guidetti, 2009). This is problematic because adding multiple cues and providing dynamic stimuli may not influence children's expression recognition in the same way it impacts that of adults. First, whereas adults' expression recognition increases when presented with dynamic versus static stimuli, children's does not (Nelson & Russell, 2011b; Widen & Russell, 2015). Second, although children can attribute emotion to body movements (Boone & Cunningham, 1998; Nelson & Russell, 2011a), they do not integrate multiple cues to emotion in the same way as adults do. For example, preschoolers' expression recognition does not increase when multiple, congruent emotion cues are presented (Nelson & Russell, 2011a), suggesting that the inclusion of additional emotion information was not beneficial. However, like adults, children as young as 6 years show a decrease in recognition when incongruent emotion cues are presented (Mondloch, 2012; Mondloch et al., 2013; Nelson & Mondloch, 2017), suggesting that the impact of multiple cues varies across conditions. Taken together, the literature suggests that children's emotion recognition is not improved by the same information that improves adults' recognition, namely movement and additional emotion cues. Determining why children's expression recognition differs from that of adults would provide insight into the mechanisms that underlie successful recognition of others' emotions. Ultimately, if motion or the availability of multiple cues impacts children's perception of emotion, models of development based solely on static, isolated facial expressions are incomplete.

Young children's failure to benefit from the presentation of dynamic multi-cue stimuli in previous studies may have occurred because they were looking at different aspects of expressions than adults were. Adults' visual attention is influenced by both movement and postural cues. Adults' face scanning

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