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Commentary

When in infancy does the "fear bias" develop?

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ABSTRACT

Much research has focused on how infants respond to emotional facial expressions. One of the key findings in this area of research is that by 7 months of age, but not younger, infants show a bias in processing fearful faces even when compared with other negative and novel facial expressions. A recent study by Heck and colleagues (*Journal of Experimental Child Psychology*, 2016, Vol. 147, pp. 100–110) challenges this idea by showing that 5-month-olds looked longer at fearful faces than at happy and at neutral faces when dynamic displays (videos) are used. Given that previous work failed to find enhanced attention to fearful faces in 5-month-olds using static displays (photographs), this was taken as evidence that biased attention to fear can be observed earlier when dynamic information is presented. However, we computed an analysis indicating that the overall amount of motion displayed in the videos in Heck and colleagues' study is confounded with emotion such that the greatest amount of motion is evident in the fearful face videos and may have driven infants' looking patterns. We discuss these findings and their limitations in the context of other research using dynamic emotion stimuli. Although these findings do not rule out the possibility that 5-month-olds are sensitive to fear, we stress the need to control for physical differences such as motion before any conclusions regarding the emergence of the fear bias during infancy can be drawn and in order to improve research practice in the field.

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Emotional facial expressions play an important role for human social interactions. How the sensitivity to process facial emotion develops during infancy has been studied intensively. One of the key findings in this area of research is that by around 7 months of age, but not younger, infants show a bias in processing fearful faces (see Leppänen & Nelson, 2012, for a review). Indeed, there is converging evidence using various methods, including looking time, event-related brain potentials (ERPs), and heart rate, to support the notion that 7-month-old infants show an attentional bias to fearful faces (e.g., Leppänen & Nelson, 2009; Peltola, Hietanen, Forssman, & Leppänen, 2013). This enhanced attention to fear seen in infants does not simply reflect a heightened sensitivity to any negative or novel facial expression given that it is not seen in response to angry faces (Krol, Monakhov, Lai, Ebstein, & Grossmann, 2015) or unfamiliar facial expressions (Peltola, Leppänen, Palokangas, & Hietanen, 2008). Critically, with respect to its developmental emergence, there are studies that compare 7-month-old infants with infants at younger ages (5 months) and find that it is not until 7 months that infants show increased attention to fearful faces (Jessen & Grossmann, 2016; Peltola, Leppänen, Mäki, & Hietanen, 2009).

A recent study by Heck, Hock, White, Jubran, and Bhatt (2016) challenges the idea that the fear bias develops only during the second half of the first year. In this study, the authors used videos of emotional displays (fearful, happy, and neutral) from a previously published stimulus set validated with adults (van der Schalk, Hawk, Fischer, & Doosje, 2011). Specifically, Heck and colleagues (2016) show that when using dynamic facial expressions, 5-month-old infants looked longer at fearful faces than at happy or neutral faces. Given that previous work failed to find enhanced attention to fearful faces in 5-month-olds using static displays (photographs) (e.g., Peltola et al., 2009), this was taken as evidence that biased attention to fear emerges earlier than previously thought but is only elicited when dynamic information is presented.

We agree with Heck and colleagues (2016) that the use of dynamic stimulus material is an important step in increasing the ecological validity of emotional stimuli. Dynamic information has been shown to impact emotion processing not only in adults (e.g., Carretié et al., 2009; Kilts, Egan, Gideon, Ely, & Hoffman, 2003) but also in the perception of emotional body information in infants (Missana, Atkinson, & Grossmann, 2015; Missana, Rajhans, Atkinson, & Grossmann, 2014). Extending existing work by investigating emotion perception from dynamic faces during infancy is, thus, an important endeavor.

However, although using videos may represent a more ecologically valid method to examine infants' sensitivity to emotions, it also introduces methodological difficulties in controlling for dynamic stimulus properties. In particular, the overall amount of motion may confound differences between emotional expressions. In the study by Heck and colleagues (2016) emotional videos showed a face moving from a neutral expression to either a happy or fearful expression, whereas in the neutral videos the facial expression remained the same throughout the videos. Thus, it is possible that the dynamic facial expression videos presented in this study vary systematically with respect to their overall amount of motion. Although systematic differences in motion content do not rule out the possibility that 5-month-olds are sensitive to fear, they do present a major confound that needs to be considered.

To investigate this possibility, we obtained the stimulus material used by Heck and colleagues (2016) from the Amsterdam Dynamic Facial Expression Set (ADFES; van der Schalk et al., 2011). We carried out an analysis of the amount of motion contained in the videos used by Heck and colleagues (2016) based on an established algorithm (e.g., Jessen & Kotz, 2011; Pichon, de Gelder, & Grèzes, 2008; Pichon, de Gelder, & Grèzes, 2009). This algorithm takes individual frames of the video and converts them to grayscale images in order to calculate mean change in luminance per pixel from one frame to the next. To account for random noise, only pixels exceeding a difference in luminance of 10 (on a scale from 0 to 255) are included in the analysis and averaged. This estimation is run for all consecutive pairs of frames over the entire duration of the video, and the overall average per video is computed from these values. The results of this analysis are shown in Figs. 1 and 2. As shown in Fig. 1, the amount of motion systematically varied between the three emotion conditions used in the study. Specifically, the greatest amount of motion is seen in the fearful faces, followed by the happy faces.