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Development of body emotion perception in infancy: From discrimination to recognition

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ABSTRACT

Research suggests that infants progress from discrimination to recognition of emotions in faces during the first half year of life. It is unknown whether the perception of emotions from bodies develops in a similar manner. In the current study, when presented with happy and angry body videos and voices, 5-month-olds looked longer at the matching video when they were presented upright but not when they were inverted. In contrast, 3.5-month-olds failed to match even with upright videos. Thus, 5-month-olds but not 3.5-month-olds exhibited evidence of recognition of emotions from bodies by demonstrating intermodal matching. In a subsequent experiment, younger infants did discriminate between body emotion videos but failed to exhibit an inversion effect, suggesting that discrimination may be based on low-level stimulus features. These results document a developmental change from discrimination based on non-emotional information at 3.5 months to recognition of body emotions at 5 months. This pattern of development is similar to face emotion knowledge development and suggests that both the face and body emotion perception systems develop rapidly during the first half year of life.

1. Introduction

Both faces and bodies convey emotional information. For survival purposes, being able to glean emotional information from bodies may be as or more important than gathering that information from faces (de Gelder, 2006); for example, one may be able to discern cues that signal a threat in the environment from a greater distance in bodies than in faces. Moreover, adults are more accurate in recognizing peak emotions from bodies than from faces (Aviezer, Trope, & Todorov, 2012a). However, most research on emotion perception in infancy and beyond has been limited to facial expressions. Therefore, the purpose of the current study was to examine the nature of the development of body emotion knowledge. Specifically, we examined recognition of body emotions as assessed by intermodal matching of emotional bodies to vocal emotions and discrimination between emotional body movements during the first half year of life.

The theoretical framework for this research is the model of emotion knowledge development proposed by Walker-Andrews (1997). According to this model, there are several levels of emotion knowledge in infancy, with more sophisticated abilities building upon the more basic levels and coming online later in development. First is the ability to simply detect or sense emotional information in the environment (e.g., can the infant physically see or hear the stimulus?). The next level of development involves the capacity to discriminate among emotional stimuli (e.g., can the infant detect differences between two body postures or vocalizations?). Finally, there is the "recognition" of emotional information, which requires that the infant be able to interpret emotional expressions and exhibit at least some level of understanding of the underlying affect (Walker-Andrews, 1997, 1998). According to

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Walker-Andrews, (1997; also see Walker, 1982), intermodal matching is a reflection of emotion recognition. This is because, in order to match emotional expressions in physically different modalities (e.g., in faces and in voices), infants must recognize at least to some extent that the information portrayed in these modalities depicts the same underlying affect.

Prior research suggests that the development of emotion processing from faces is consistent with the model proposed by Walker-Andrews (1997) described above. In particular, infants around 3–4 months of age appear to be able to discriminate among facial emotional expressions and vocal emotional expressions by around 5–7 months (Flom & Bahrick, 2007), and it takes longer (5–7 months) before infants begin to exhibit evidence of facial emotion recognition by demonstrating intermodal matching (Vaillant-Molina, Bahrick, & Flom, 2013; Walker-Andrews, 1997, 1998). The current study examined whether this model also applies to the development of body emotion knowledge. It is important to study the nature of development of sensitivity to body emotions because, as reviewed briefly below, body and face emotions work in concert in adulthood, and in some cases, emotional information is more accurately derived from bodies than from faces. Moreover, some researchers have argued that knowledge about bodies is slower to develop than knowledge about faces (Slaughter, Heron-Delaney, & Christie, 2012), while others have suggested a similar trajectory of development in both cases (Bhatt, Hock, White, Jubran, & Galati, 2016; Marshall & Meltzoff, 2015; Meltzoff, 2011). The analysis of the development of body emotion knowledge will provide a contrast between these approaches by examining whether the development of sensitivity to body emotions is similar to that of face emotion knowledge.

1.1. Children's and adults' perception of body emotions

Although still lagging behind research conducted on facial expressions, adults' and children's perception of body emotions has been measured in a variety of tasks, encompassing both behavioral and physiological measures (for reviews, see de Gelder, 2006; de Gelder, de Borst, & Watson, 2015; for select studies on children, see Geangu, Quadrelli, Conte, Croci, & Turati, 2016; Peterson, Slaughter, & Brownell, 2015; Tuminello & Davidson, 2011).

Several studies have found that, like facial expressions, body emotion is highly recognizable for adults (Atkinson, Dittrich, Gemmell, & Young, 2004; de Gelder & Van den Stock, 2011) and even preschool-aged children (Nelson & Russell, 2011; Ross, Polson, & Grosbras, 2012). However, adult-like emotion knowledge, including emotion recognition, may not fully develop until adolescence or even later (Ross et al., 2012). For example, Ross et al. (2012) found that even older teenagers (16–17 years) were significantly less accurate than adults when identifying body emotions (happy, sad, scared, angry) with blurred faces in a forced-choice task.

Several studies have also investigated how information from other sources (e.g., faces, voices) influences perception of body emotion. For example, Stienen, Tanaka, and de Gelder (2011) found that adults' emotion categorization of body expressions in a masking paradigm was influenced by concurrently presented vocalizations that were either emotionally congruent or incongruent to the body and vice versa. Similarly, Aviezer et al. (2012a) and Aviezer, Trope, and Todorov (2012b) found that when faces and bodies both express emotions, adults' perception of the facial emotion is often strongly influenced by the body emotion. Moreover, discrimination among peak emotions is more accurate from isolated bodies than from faces (Aviezer et al., 2012a).

Taken together, these studies suggest that body emotion works with other sources of emotion in an integrated manner and is at least as important as other sources of emotion information (and perhaps more important in some instances, see Aviezer et al., 2012a). However, the way in which this skill develops and the time course of its development is still unclear. Therefore, it is important to further investigate this important ability, as it is clearly an influential source of socioemotional information.

1.2. Infants' perception of body emotions

Based on the Walker-Andrews (1997) model described previously, two of the early markers of emotion perception relate to the ability to detect and discriminate between emotions in the environment. One set of studies examining infants' detection and discrimination of body emotion using neurological methods comes from Missana and colleagues. When 4- and 8-month-olds viewed happy and fearful body expressions as dynamic, point-light displays (Missana, Atkinson, & Grossmann, 2015; Missana & Grossmann, 2015), only 8-month-olds exhibited significant differences in their Pc (late-latency component) response to happy and fearful bodies, and the magnitude of their Pb (early-latency component) response was larger when the displays were inverted (Missana et al., 2015). Likewise, upright happy and fearful displays elicited differential electroencephalogram (EEG) patterns only in 8-month-olds (Missana & Grossmann, 2015). Finally, 8-month-olds exhibited significantly more negative N290 and Nc responses to static, full-light displays of upright fearful bodies compared to happy bodies, but not when the bodies were inverted (Missana, Rajhans, Atkinson, & Grossmann, 2014). Taken together, these studies by Missana and colleagues indicate that 8-month-olds, but not 4-month-olds, rapidly discriminate between happy and fearful body emotion. However, across their studies, Missana and colleagues only tested 4-month-olds on point-light displays, so it is uncertain whether younger infants can distinguish between full-light displays of body emotion, which would arguably provide more information than the comparatively impoverished point-light displays.

As noted earlier, according to Walker-Andrews' (1997) model, a more advanced skill related to emotion perception is emotion recognition. Prior research shows that infants recognize facial emotions in the sense proposed by Walker-Andrews (1997) by demonstrating that they match vocal emotions to corresponding facial emotions (Kahana-Kalman & Walker-Andrews, 2001; Vaillant-Molina et al., 2013; Walker, 1982). For example, Vaillant-Molina et al. (2013) found that 5-month-olds, but not 3.5-month-olds, match other infants' vocal emotions to the corresponding dynamic facial expression in an intermodal matching procedure.

Extending this research on intermodal matching to body emotion, Zieber and colleagues found that infants successfully match happy and angry emotional vocalizations to the corresponding body emotion by 6.5 months when the bodies are upright but not inverted (Zieber, Kangas, Hock, & Bhatt, 2014a; Zieber, Kangas, Hock, & Bhatt, 2014b). Furthermore, they matched when viewing