



Empathy development from 8 to 16 months: Early signs of concern for others

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ABSTRACT

The study examined the responses of typically developing infants to the distress of another, prior to and following the transition to the second year. Infants' responses to maternal simulations of distress and to a peer distress videotape were observed from 8 to 16 months, using an accelerated longitudinal design (overall $n = 37$). Modest levels of affective and cognitive empathy for another in distress were already evident before the second year, and increased gradually (and not always significantly) across the transition to the second year. Prosocial behavior was rare in the first year and increased substantially during the second year. Self-distress reactions were rare overall. Individual differences in cognitive and affective empathy assessed in the first year, particularly at 10-months, predicted the levels of prosocial behavior observed in the second year. No gender differences were found. Theoretical implications and future research directions are discussed.

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Concern for others is an important feature of healthy social functioning. Empathic concern plays a key role in facilitating prosocial behavior towards others in need and is implicated in the development of morality (Batson, 1991; Eisenberg, Fabes, & Spinrad, 2006; Malti, Gummerum, Keller, & Buchmann, 2009; Vaish, Carpenter, & Tomasello, 2009). It is therefore of great interest to identify the roots and developmental course of empathy. Thus far, the early development of concern for others has been examined during the second year of life and onward (Knafo, Zahn-Waxler, Van Hulle, Robinson, & Rhee, 2008; Zahn-Waxler, Radke-Yarrow, & King, 1979; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992; Zahn-Waxler, Robinson, & Emde, 1992). Much is still unknown, however, about the development of empathy earlier in life (Geangu, 2009). The current study aims to shed new light on this important issue.

How do the responses of infants to the distress of another person develop prior to and during the transition to the second year? According to Hoffman's influential theory of empathy (Hoffman, 1975, 1984, 2000; see also Eisenberg et al., 2006), the transition to the second year marks a significant shift in early empathic responding, because this is when the capacity for true, other-oriented empathy (or sympathy) is thought to emerge. Prior to the second year, infants have been considered to be capable only of a more rudimentary, self-focused form of empathic arousal, known as empathic distress (Hoffman, 1975, 1984, 2000). Somewhat surprisingly, however, there have been no studies in which infants' empathic responses were followed throughout this period, beginning prior to and ending following the transition to the second year. Thus, direct and systematic evidence regarding the hypothesized shift from empathic distress to empathic concern during this period is missing. The goal of the present study was therefore to examine the development of infants' reactions to others' distress across the transition to the second year. Although empathy is not limited to responses to distress and can be manifested in

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other situations as well, we chose to focus on distress in the present study, because this context has been at the center of prior work on empathy development as well as in Hoffman's theory.

1. The nature of empathy

Empathy is a vicarious socio-emotional response that is induced by the perception of another individual's affective state. It entails feeling an emotion that is similar to the one likely experienced by the other person (e.g., Batson, 2009; Decety & Meyer, 2008; Eisenberg et al., 2006; Preston & de Waal, 2002; Thompson, 1987). Therefore, when another individual is in distress, empathy involves feeling at least some level of discomfort analogous to what the other appears to be feeling. Such empathic arousal can give rise to concern, also known as 'empathic concern' or 'sympathy', when the person remains focused on the other in distress and *feels for* him or her. However, empathic arousal can also lead to a self-focused distress response, often labeled 'personal distress' or 'empathic distress'. A self-distress response emerges if the observer shifts the focus of concern from the other person to the self, as reflected by feelings of disturbance, anxiety, and the like (e.g., Batson, 1991, 2009; Eisenberg et al., 2006; Preston & de Waal, 2002). An important variable affecting whether empathic arousal will lead to concern for the other or to self-focused distress is the individual's ability to regulate negative emotional arousal. Studies with children have shown that the ability to self-regulate negative emotions effectively leads to greater empathic concern (sympathy) to others' distress, whereas poor regulatory capacities reduce the likelihood of sympathy and increase self-distress reactions (Davidov & Grusec, 2006; Eisenberg, Wentzel, & Harris, 1998; Eisenberg et al., 2006).

2. Early empathy development: Hoffman's theory

Early formulations of Hoffman's theory (e.g., Hoffman, 1975, 1984, 1990) included four stages with the first stage ("global empathy") referring to the first year of life. More recent formulations include five stages, with the first two stages ("new-born reactive cry" and "egocentric empathic distress") covering the first year (e.g., Hoffman, 2000). In either case, Hoffman proposes that the capacity for other-oriented empathy (or sympathy) emerges in the second year of life, though there are some individual differences.

According to Hoffman, human beings have an inborn capacity to experience empathy – e.g., to feel the distress experienced by others. This ability is the result of multiple mechanisms, the most rudimentary of which are present from birth (e.g., mimicry, conditioning), with more cognitively complex mechanisms developing later on (e.g., role-taking). In this view, during the first year of life infants do not yet possess the awareness of themselves as separate physical entities from others. The distress of another individual is therefore confused with or perceived in part as the infant's own distress. As a result, infants' responses to others' distress at this age are still limited to empathic distress that is self-focused (or undifferentiated) in nature, and infants may seek comfort for the self when exposed to a distressed other. Only in the second year of life do infants first become capable of experiencing true concern for another in distress (i.e. other-oriented empathy, sympathy). By this time they can differentiate self from other, and thus focus on and feel concern for the other. These empathic feelings are thought to motivate infants' early prosocial attempts to comfort and help others.

According to this view, one would expect that other-oriented empathy would be rare prior to, and emerge following, the transition to the second year. However, as noted above, and elaborated next, this hypothesis has not been directly examined.

3. Studies of early empathy development

Relatively few studies have examined empathic responses during the first year of life. The majority of these studies have focused on the neonatal period, examining newborns' responses to the distress cries of another infant (e.g., Dondi, Simion, & Caltran, 1999; Martin & Clark, 1982; Sagi & Hoffman, 1976; Simner, 1971). In these studies, infants typically heard the recorded cries of another infant for several (4–6) min, and their responses to the peer's distress were observed and compared to a baseline and/or to other auditory stimuli (e.g., a computerized noise, the cry of a young chimp, the infant's own pre-recorded cry). This body of work has shown that young infants typically respond with self-distress (e.g., cry) when they hear the recording of a peer's cry, whereas they are less affected by other, equally loud or abrupt sounds (and even by their own pre-recorded cry; Dondi et al., 1999; Martin & Clark, 1982; Sagi & Hoffman, 1976; Simner, 1971). The crying of another infant is therefore particularly likely to trigger contagious crying and distress in the young infant, and this vicariously induced distress reaction to the distress of a conspecific has been interpreted as evidence of empathic distress, a rudimentary form of empathy. Recently, Geangu, Benga, Stahl, and Striano (2010) have shown that a contagious crying response is not limited to the newborn period. Infants 1-, 3-, 6- and 9-months of age were exposed to a recorded cry (5–6 min), and the majority of them showed vocal and facial distress – at equivalent rates, duration, and intensity across all age groups.

This body of work is important in showing infants' predisposition, and continued tendency, to experience distress (empathic distress, contagious crying) upon hearing the distress of another infant for several minutes. However, it does not directly address the present research question which concerns the hypothesized shift from empathic distress to empathic concern following the transition to the second year. Also, it appears that empathic distress responses are not always shown by infants in reaction to another's distress. A self-distress response may depend on the nature of the distress stimulus (e.g., its intensity and duration) as well as on features of the situation and context (e.g., where the stimulus is encountered). For example, in a study by Hay, Nash, and Pedersen (1981), the researchers sought to examine empathic distress in 6-month-

olds in a naturalistic situation. Pairs of infants were observed in the same playroom, with their mothers present, and the responses of each infant to the spontaneous fussing and crying of the peer were examined. Infants rarely responded with distress (i.e., empathic distress, or emotional contagion) to the distress of the peer in this situation, nor did they ignore the other infant. Rather, the large majority of infants directed their attention to the crying peer, and approximately half of them also oriented towards the other infant by leaning, gesturing, touching, or otherwise contacting him or her (Hay et al., 1981).

These responses appear to be other-oriented rather than self-focused, although direct markers of concern for the other (such as facial expressions or vocalizations of concern) were not examined by Hay et al. (1981). Moreover, although empathic distress was rare, there was evidence of a cumulative effect, with infants more likely to become distressed eventually if the peer had shown continued fussing and crying. This might indicate that infants remained focused on the other infant in distress as long as they could still regulate their empathic arousal (e.g., if the distress was only brief), but became dysregulated and self-distressed when the situation became more stressful. Although this study does not directly elucidate the issue of empathy development during the transition to the second year, it suggests that even before then, infants' repertoire of responses when confronted with the distress of another might not be limited to empathic self-distress, but may also include other-oriented responses.

Beyond the first year of life, carefully designed developmental studies have been conducted on infants' and toddlers' responses to the distress of others, with observations typically beginning early in the second year (around 12–14 months) and onward (e.g., Demetriou & Hay, 2004; Knafo et al., 2008; Zahn-Waxler et al., 1979; Zahn-Waxler, Radke-Yarrow, et al., 1992; Zahn-Waxler, Robinson, et al., 1992). Most of these studies were specifically designed to assess concern for others, in ways that tapped multiple aspects of infants' and toddlers' responses to distress, including affective, cognitive and behavioral aspects. The affective component of empathy is reflected by the child's emotional expression of concern for the victim (empathic concern, affective concern), as evident by facial expressions, vocalizations, and gestures. The cognitive component refers to the child's inquiry, or hypothesis testing behavior, reflecting the child's active attempts to explore and cognitively comprehend what is happening to the victim. The behavioral component is observed through prosocial behavior, reflecting the child's attempts to help or comfort the distressed other.

These developmental studies beginning early in the second year, showed clear evidence of concern for others, expressed through all three markers. These studies also provided important information regarding the different components of concern for others and their development, regarding genetic and environmental contributions, contextual influences, and more (Demetriou & Hay, 2004; Knafo et al., 2008; Volbrecht, Lemery-Chalfant, Aksan, Zahn-Waxler, & Goldsmith, 2007; Zahn-Waxler et al., 1979; Zahn-Waxler, Radke-Yarrow, et al., 1992; Zahn-Waxler, Robinson, et al., 1992). Because these developmental studies began in the second year however, they do not provide direct evidence regarding the shift from self-focused empathic distress to other-focused sympathy that is hypothesized to take place during the transition to the second year. To directly test this hypothesis, infants' responses to the distress of others should be observed longitudinally for a period of time beginning prior to, and ending following, their first birthday. This was therefore the goal of the present exploratory study, in which infants responses to distress were examined from 8 to 16 months.

4. The present study

The purpose of the present study was to examine the responses of typically developing infants to the distress of another before and after the transition to the second year. We used an accelerated-longitudinal design to document infant's responses to maternal distress simulations and to a videotape of a crying peer, from 8 to 16 months. Multiple behaviors were assessed, in particular: infants' distress responses, their empathic concern (affective empathy), hypothesis testing (cognitive empathy), and prosocial behavior.

Four research questions guided our investigation. The first, and most important, is concerned with the normative developmental course of concern for others from 8 to 16 months. Is it the case, as would be expected based on Hoffman's theory, that affective concern (sympathy), hypothesis testing, and prosocial behavior are absent during the first year of life, and emerge shortly following the transition to the second year? Or is it possible to observe early markers of concern for another in distress (affective, cognitive, and/or behavioral) prior to the second year, as might be implied by Hay et al.'s study?

The second, and related question concerns the developmental course of empathic distress. Would infants exhibit a self-distress reaction in response to distress stimuli, which took place in a natural setting and were briefer and milder than those typically employed in research on contagious crying? We also asked whether the likelihood of a self-distress response changes (decreases) during the transition to the second year.

Unlike the first two questions which focus on normative development, the third question focuses on individual differences. If there is variability in infants' affective and cognitive empathic responses before the second year of life, would these early individual differences predict subsequent prosocial behavior assessed at a later time (i.e., in the second year)?

The final research question pertains to gender differences. Prior studies with children in the first years of life have sometimes found sex differences, favoring girls, in empathic responses (e.g., Knafo et al., 2008; Volbrecht et al., 2007; Zahn-Waxler, Radke-Yarrow, et al., 1992; Zahn-Waxler, Robinson, et al., 1992). Can these gender differences in empathy be observed prior to and during the transition to the second year?

Although the present study was exploratory in nature, it provides a very first examination of these interesting and theoretically important research questions. It can therefore shed new light on the development of empathy and concern for

Table 1
Study design.

Age (in months)	8	10	12	14	16
Cohort 1 (<i>n</i> = 12)	T1	T2	T3		
Cohort 2 (<i>n</i> = 12)		T1	T2	T3	
Cohort 3 (<i>n</i> = 13)			T1	T2	T3

Note. T1, T2, T3 = first, second, and third assessment, respectively.

others during infancy, especially given the substantial gap in the research literature regarding empathy in the first year of life.

5. Method

5.1. Participants

Thirty-seven infants (21 girls), from a large, East Coast US metropolitan participated in the study together with their mothers. We employed an accelerated-longitudinal design: three cohorts of infants who were 8-months-old (*n* = 12), 10-months-old (*n* = 12), and 12-months-old (*n* = 13) at the time of the first assessment, were observed again two and four months later. Thus, each infant was assessed at three time points, yielding data covering the period from 8 to 16 months with planned missing data (Widaman, 2006). Table 1 presents the breakdown of participants by cohort and assessment at each age.

The majority of mothers were European-American (87%), with the remainder being African-American (5%), Hispanic-American (5%), and Asian-American (3%). Families were of middle to upper socio-economic status, with 92% of the mothers having had at least some post-secondary education. Families were recruited using flyers posted in pediatric clinics and mother-infant play group centers. As a token of thanks for their participation mothers received an edited videotape of their baby's footage from the study and age-appropriate toys for their infant.

5.2. Procedure and measures

Assessments were carried out in the infants' homes by a trained experimenter. Infants were assessed in three episodes of distress, which were repeated at each time point. We employed the same episodes and coding system previously used for assessing empathic responses in older infants and toddlers [maternal simulations of distress and the MacArthur Twin study empathy coding scheme (see below); e.g., Knafo et al., 2008; Zahn-Waxler, Radke-Yarrow, et al., 1992; Zahn-Waxler, Robinson, et al., 1992], to our sample of younger infants. This approach has the advantage of linking the current results to previous work on concern for others in older infants and young children.

5.2.1. Maternal simulations of distress

Infants were exposed to two simulations of maternal distress. In the first, the mother played with the infant using a pounding toy. While playing, the mother pretended to hit her finger with a toy hammer and simulated distress for 60 s. In the second simulation, the mother walked towards the infant and pretended to bump her knee into a piece of furniture, again feigning distress for 60 s. The two episodes were separated by approximately 20 min during which infants engaged in several diverting activities. In both of these episodes, mothers were instructed to assume a facial expression of distress accompanied by vocal expression of pain (moderate cries) while rubbing their "hurt" thumb/knee for 30 s. Following the experimenter's cue, mothers were asked to gradually subside their crying for additional 30 s until reaching neutral affect. Finally, mothers showed their infant that their thumb/knee no longer hurt, and resumed playing with their child. Mothers were instructed to avoid eye contact with their child during the distress simulation, so as not to invite a particular response. Similar procedures have been used in prior work on empathy development with older infants, toddlers and young children (e.g., Kiang, Moreno, & Robinson, 2004; Knafo et al., 2008; Sigman, Kasari, Kwon, & Yirmiya, 1992; Young, Fox, & Zahn-Waxler, 1999; Zahn-Waxler, Radke-Yarrow, et al., 1992; Zahn-Waxler, Robinson, et al., 1992). These simulations were selected because they present the infant with unambiguous instances of another's distress, yet without being too intense or overwhelming, as the distress is only moderate at its peak and the episodes are relatively short and take place in a familiar environment.

5.2.2. Distressed peer video

In order to examine infants' responses to distress in another context, not only to the (simulated) distress of the mother, a third distress episode was included in which the infants watched a 60-s video presentation of another (unfamiliar) infant crying. While watching the video segment the infant was situated in front of the family's television screen but was free to move around. Video presentations of another's distress have been used previously for assessing infants' empathic responses (e.g., Ungerer et al., 1990), although less frequently than distress simulations.

5.2.3. Coding of infants' responses

Infants' responses to all three episodes were videotaped for subsequent coding. The coding system used was the empathy coding scheme from the MacArthur Longitudinal Twin Study, which has been developed by Zahn-Waxler and Robinson and their colleagues, and used extensively in prior research (e.g., Kiang et al., 2004; Knafo et al., 2008; Light et al., 2009; Moreno, Klute, & Robinson, 2008; Young et al., 1999; Zahn-Waxler, Radke-Yarrow, et al., 1992; Zahn-Waxler, Robinson, et al., 1992). Because this coding scheme includes a wide range of reactions to distress, only those responses pertinent to the present report are described below.

5.2.4. Concerned affect

Affective expressions of apparent concern for the victim, including facial, vocal, or gestural-postural manifestations were rated on a 4-point scale on which 1 = *absent*, 2 = *slight* (some concern expressed in face or voice, e.g., brow furrow, but relatively fleeting or slight), 3 = *moderate* (prolonged brow of eyes or vocal contours expressing concern or sadness), and 4 = *substantial* (sustained sadness expressed in sympathetic vocal tones, cooing, or facial expressions, e.g., a sympathetic face in which eyebrows are drawn down and brow drawn up over the nose, or a sad expression with corners of the mouth drawn downward).

5.2.5. Hypothesis testing

Inquiry behaviors indicating that the child attempts to explore the distress and/or comprehend cognitively what is happening to the victim were rated on a 4-point scale on which 1 = *absent*, 2 = *simple non-vocal or simple vocal* inquiries or exploration about the distress (e.g., non-vocal: touches own body part analogous to victim, looks back and forth from victim's face to hurt part or to other adult, or back and forth from video to mother; vocal: vocalization with a questioning intonation), 3 = *combination of both non-vocal and vocal inquiry/exploration* of the distress (a single query combining both non-vocal and vocal hypothesis testing), and 4 = *repeated or relatively sophisticated attempts* to understand the distress, combining both vocal non-vocal inquiry/exploration.

5.2.6. Distress

A score of 0 was assigned if no self-distress was evident by the infant, and a score of 1 was assigned if the infant expressed distress during the episode, as reflected by any of the following behavioral markers: fear present for several seconds, facial grimace with eyes wide and teeth barred, whimpering, or crying.

5.2.7. Prosocial behavior

Attempts to help or comfort the distressed victim were rated on a 4-point scale, with 1 = *none*, 2 = *slight assistance* (one pat or verbalization), 3 = *moderate assistance* (assists for 3–5 s, or repeatedly verbalizes prosocially), and 4 = *prolonged assistance* (assists for more than 5 s).

5.2.8. Reliability

Two trained, independent coders observed and rated the videotaped episodes, with 12% of the episodes (pertaining to 13 infants from different cohorts) rated by both observers for the purpose of calculating inter-rater reliability. Coders took multiple passes of each episode in order to pinpoint and ascertain infants' reactions. Inter-rater reliabilities were high, with kappa values ranging from .73 to 1.00 for all the dimensions coded.

6. Results

6.1. The development of concerned affect, hypothesis testing, and prosocial behavior, from 8 to 16 months

6.1.1. Descriptive statistics

Table 2 presents the means and standard deviations of concerned affect, hypothesis testing, and prosocial behavior for the maternal simulations (the two simulations averaged) and for the distressed peer video episode, at each age and for each cohort. If other-oriented empathy is not yet present before the second year, then one would expect mean ratings in the region of 1 (=none/absent) for both concerned affect and hypothesis testing during the first-year assessments. As can be seen from the table, however, at both the ages of 8- and 10-months, the average ratings of infants' concerned affect and hypothesis testing were all in the region of 2 or higher (on 1–4 scales) in response to both the maternal simulations and the peer distress video. Thus, modest levels of other-oriented empathy were already evident before the second year of life, for both the affective component of empathy (facial expressions, vocalizations and gestures reflecting concern) and the cognitive component of empathy (inquiry behavior, attempts to comprehend the victim's state through non-vocal explorations, vocalizations, or both). Thus, the transition to the second year (from 10-months to 12-months and 14-months) was not marked by the emergence of empathic responses, but rather was characterized by continuous, gradual increases in both concerned affect and hypothesis testing.

In contrast, mean ratings of prosocial behavior were close to 1 (=none) during the 8- and 10-months assessments, reflecting that attempts to comfort or help the victim were rare in the first year of life (see also Fig. 1, which presents the percentages

Table 2

Means and standard deviations of infants' responses to distress.

		Age (in months)				
		8	10	12	14	16
		M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
<i>I. Maternal simulations of distress</i>						
Cohort 1 (n = 12)	Concerned affect	2.25 (.40)	2.37 (.38)	2.64 (.64)		
	Hypothesis testing	2.04 (.14)	2.25 (.40)	2.50 (.55)		
	Prosocial behavior	1.12 (.22)	1.25 (.33)	1.27 (.41)		
Cohort 2 (n = 12)	Concerned affect		2.62 (.48)	2.75 (.49)	2.35 (.53)	
	Hypothesis testing		2.37 (.48)	2.70 (.26)	2.50 (.47)	
	Prosocial behavior		1.33 (.49)	1.95 (.79)	1.75 (.85)	
Cohort 3 (n = 13)	Concerned affect			2.43 (.34)	3.00 (.61)	2.96 (.69)
	Hypothesis testing			2.21 (.27)	2.35 (.47)	2.96 (.66)
	Prosocial behavior			1.21 (.39)	1.58 (.89)	2.29 (1.16)
Total sample	Concerned affect	2.25 (.40)	2.50 (.44)	2.62 (.52)	2.72 (.65)	2.96 (.69)
	Hypothesis testing	2.04 (.14)	2.31 (.44)	2.50 (.43)	2.41 (.47)	2.96 (.66)
	Prosocial behavior	1.12 (.22)	1.29 (.41)	1.50 (.65)	1.65 (.85)	2.29 (1.16)
<i>II. Distressed peer video</i>						
Cohort 1 (n = 12)	Concerned affect	2.17 (.39)	2.17 (.39)	2.30 (.67)		
	Hypothesis testing	2.00 (.00)	2.17 (.39)	2.40 (.52)		
	Prosocial behavior	1.00 (.00)	1.08 (.28)	1.30 (.48)		
Cohort 2 (n = 12)	Concerned affect		2.42 (.51)	2.44 (.53)	2.56 (.53)	
	Hypothesis testing		2.33 (.49)	2.33 (.50)	2.56 (.53)	
	Prosocial behavior		1.08 (.29)	1.22 (.66)	1.11 (.33)	
Cohort 3 (n = 13)	Concerned affect			2.17 (.75)	2.61 (.51)	2.67 (.65)
	Hypothesis testing			2.00 (.63)	2.54 (.52)	2.50 (.52)
	Prosocial behavior			1.00 (.00)	1.31 (.63)	1.25 (.62)
Total sample	Concerned affect	2.17 (.17)	2.29 (.46)	2.32 (.63)	2.59 (.50)	2.67 (.65)
	Hypothesis testing	2.00 (.00)	2.25 (.44)	2.28 (.54)	2.54 (.51)	2.50 (.52)
	Prosocial behavior	1.00 (.00)	1.08 (.28)	1.20 (.50)	1.23 (.52)	1.25 (.62)

Note. All rating scales range from 1 to 4.

of infants who showed helping attempts at each age, as reflected by a rating of 3 or higher). Prosocial behavior towards the distressed mother increased in frequency during the second year of life, reaching fairly high levels by the 16-months assessments. Across ages, prosocial behavior was far more frequent during the maternal simulations than in response to the peer distress video presentation (see Table 2 and Fig. 1), for in the latter case there was no one that infants could try to assist.

6.1.2. HLM analysis

To assess the rate of growth of empathic responses from 8 to 16 months, we employed Hierarchical Linear Modeling (HLM; Raudenbush, Bryk, Cheong, & Congdon, 2004). Although relatively modest, the present sample size is considered adequate for simple HLM analyses (Burchinal, Nelson, & Poe, 2006). The HLM analyses were conducted separately for the maternal simulations (both simulations averaged) and for the peer distress video assessment, on the three dependent measures: concerned affect, hypothesis testing, and prosocial behavior (all on 1–4 scales).

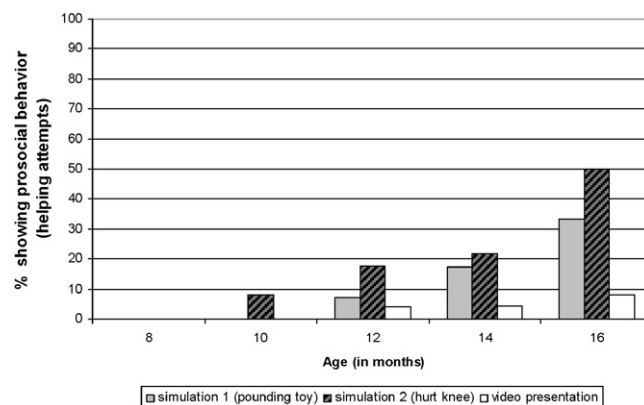


Fig. 1. Percentage of infants showing prosocial behavior at each assessment. Note. The prosocial behavior scale ranges from 1 to 4; the cut-off value used in this figure was 3 or higher, which reflects a clear helping attempt (a score of 2, reflecting "slight assistance", was not selected as the cut-off point, because it can be ambiguous at a young age whether a single pat was truly intended to help the other).

Table 3

HLM estimates of responses to distress from 8 to 16 months, for maternal simulations and peer distress video.

	Maternal simulations		Peer distress video	
	Coefficient	SE	Coefficient	SE
<i>Concerned affect</i>				
Intercept	2.62***	.07	2.41***	.07
Age slope	.05	.03	.05	.03
<i>Hypothesis testing</i>				
Intercept	2.45***	.06	2.33***	.05
Age slope	.12***	.03	.08**	.03
<i>Prosocial behavior</i>				
Intercept	1.56***	.10	1.16**	.05
Age slope	.14**	.05	.04	.03

Note. Because the dependent measures were assessed on 1–4 scales, testing the significance of the intercept as being different from zero was not appropriate (as the lowest possible value was 1). In order to test the significance of the intercepts we therefore conducted another set of analyses in which the measures were converted to a 0–3 scale (this affects only the intercept), and the significance levels shown in this table are according to those corrected tests (for ease of interpretation, the coefficient values reported were kept in the original 1–4 scale).

** $p < .01$.

*** $p < .001$.

The level-1 model estimates the developmental trajectory of each individual infant (y) as a function of the intercept (p_0 ; score at the median age of assessment), the slope (p_1 ; rate of linear change over time), and a random error component (e):

$$y = p_0 + p_1(\text{age}) + e$$

Age was centered around the sample's median (of 12 months).

For the level-2 model we tested both a “full model” and a “reduced model” (Miyazaki & Raudenbush, 2000). In the full model, the intercept (p_0) and the age slope (p_1) were modeled first as a function of cohort and gender. Cohort was coded using two dummy-variables, one reflecting participation in cohort 2 and the other in cohort 3, with cohort 1 set as the comparison (0) group. As the inclusion of gender did not yield any significant effects, it was omitted from the final analyses reported here. The following represents the “full model”, where the intercept and slope are estimated as a function of the infant's inclusion in a particular cohort and an error term:

$$p_0 = b_{00} + b_{01}(\text{cohort } 2) + b_{02}(\text{cohort } 3) + r_0$$

$$p_1 = b_{10} + b_{11}(\text{cohort } 2) + b_{12}(\text{cohort } 3) + r_1$$

The reduced model, in contrast, does not take into account any differences associated with cohort, thus testing a single underlying developmental trajectory by estimating the mean intercept and slope of the entire sample:

$$p_0 = b_{00} + r_0$$

$$p_1 = b_{10} + r_1$$

The likelihood ratio test (Miyazaki & Raudenbush, 2000) showed that the difference in fit between the reduced and full models was not significant for any of the dependent measures. Thus, accounting for cohort effects did not significantly improve the fit, and the simpler, reduced model could be seen as fitting the data equally well. Hence, we report in this paper only the results pertaining to the reduced model.

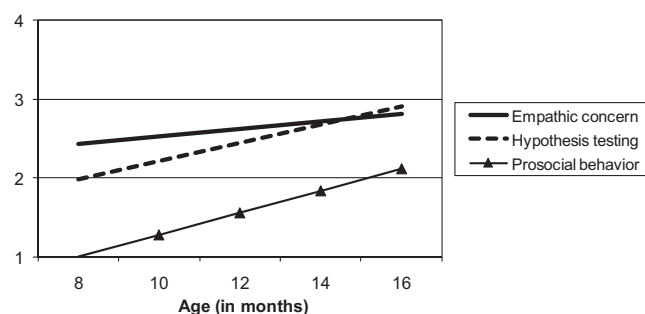


Fig. 2. Estimated HLM growth curves of concerned affect, hypothesis testing, and prosocial behavior, in response to maternal simulations of distress. Note. All rating scales range from 1 to 4.

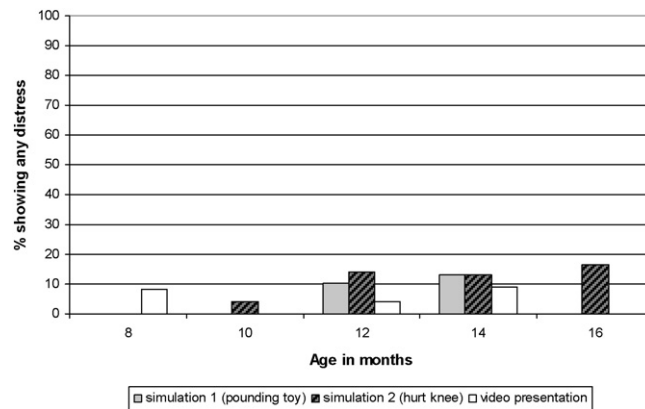


Fig. 3. Percentage of infants showing self-distress at each assessment.

Table 3 presents the results of the HLM analyses (level-2 model estimates), and Fig. 2 presents the estimated growth curves of the three dependent measures in response to the maternal distress simulations. Note that the intercept reflects the estimated level of the dependent variable at the median age of assessment (12 months), and the age slope coefficient reflects the estimated rate of growth over time, expressed in units of the dependent variable per month. As can be observed in the table and figure, concerned affect showed only weak increase from 8 to 16 months, with a small and non-significant age slope in response to both the maternal simulations and the distressed peer video. Hypothesis testing, on the other hand, increased more substantially with age, with a significant slope observed both in the maternal simulation episodes and in the peer video episode. In the former case, for example, the growth rate was approximately eighth of a scale-point per month (see Table 3). Hence, some gradual growth with age was apparent for the cognitive component, hypothesis testing. Furthermore, both the affective and cognitive components of empathy were estimated to be evident, at noticeable levels, before the second year of life (see Fig. 2). The HLM analysis further showed that prosocial behavior towards the distressed mother increased significantly with age, whereas prosocial behavior in the distressed peer video episode did not increase significantly. Once again, this difference is likely due to the absence of an actual person to whom infants could direct their prosocial attempts in the latter case. In either situation, however, prosocial behavior was estimated to be absent or at negligible levels during the 8- and 10-months assessments.

Overall then, the descriptive and inferential analyses converged in showing that modest levels of affective and cognitive empathy towards a distressed other were present at 8- and 10-months, and increased gradually (not always significantly) during and following the transition to the second year. Prosocial behavior, on the other hand, was rare in the first year and became apparent during the second year.

6.2. Self-distress reactions from 8 to 16 months

Fig. 3 presents the percentage of infants who exhibited distress in response to the other's distress in each episode at each age. As evident from the figure, distress reactions were infrequent in the present study, at all ages assessed. Among the 8- and 10-month-olds in particular self-distress was rare, shown by none of the infants in 2 out of 3 episodes and by only one infant in the remaining episode (see Fig. 3).

6.3. Correlations between early empathy and subsequent prosocial behavior

Overall scores of affective concern, hypothesis testing, and prosocial behavior were created for each child at each age, by computing means across the three episodes (the two maternal simulations and video episode). This aggregation was done in order to reduce the number of correlations to be tested, particularly given the small sample size. Table 4 presents the correlates between overall empathic concern and hypothesis testing assessed at 8- and 10-months and overall prosocial behavior assessed concurrently and subsequently. As can be seen from the table, affective and cognitive empathy at 10-months consistently predicted subsequent prosocial behavior, assessed two and four months later (as well as concurrently). The earlier measures were less consistently predictive, with only one correlation reaching significance, that between concern at 8-months and prosocial behavior four months later. Thus, individual differences in empathy assessed prior to the second year were predictive of subsequent prosocial behavior, particularly when measured at 10-months and to a lesser degree at 8-months.

Table 4

Correlations between overall affective and cognitive empathy scores and overall prosocial behavior scores.

Prosocial behavior		8-months		10-months	
		Concern	Hypothesis-testing	Concern	Hypothesis-testing
8 months	<i>r</i>	.26	.52 [†]	–	–
	<i>n</i>	12	12		
10 months	<i>r</i>	.06	.20	.38 [†]	.53 ^{**}
	<i>n</i>	12	12	24	24
12 months	<i>r</i>	.59 [*]	–.23	.58 ^{**}	.59 ^{**}
	<i>n</i>	11	11	21	21
14 months	<i>r</i>	–	–	.67 [*]	.76 ^{**}
	<i>n</i>	10	10		

* $p \leq .05$.** $p \leq .01$.† $p \leq .08$.

6.4. Gender differences

T-tests were used for examining potential differences between boys and girls in affective concern, hypothesis testing, and prosocial behavior, at the different ages. Although girls' means tended to be slightly higher than boys', no significant differences were found for any of the measures at any of the ages. (Also, as noted earlier, adding gender as a level-2 variable in the HLM analyses did not yield any significant effects.)

7. Discussion

The current study presents the first systematic attempt to examine the development of concern for others before and after the transition to the second year. The responses of infants to the distress of another were observed from 8 to 16 months by means of an accelerated-longitudinal design. The first research question examined Hoffman's proposition that other-oriented empathy emerges during the second year of life (Hoffman, 1975, 1984, 2000). Contrary to this notion, our findings showed that affective and cognitive markers of empathy were already present at noticeable levels at 8- and 10-months, and continued to increase gradually into the second year. Our evidence of early other-oriented empathic responding is consistent with, and extends, Hay et al.'s (1981) findings.

Prosocial behavior had a different developmental course: attempts to help or comfort the distressed mother were very rare in the first year of life, and increased substantially during the second year, with considerable levels shown by 16 months. Prosocial behavior may emerge later than empathy because it requires more advanced self-regulation; it entails not only the understanding that someone is in distress and feeling concern for that person, but also the coordination of affect and behavior in order to produce a goal-directed response. It also requires motor skills and other physical abilities that younger infants have not yet mastered. The more complex integration of affect, cognition and action underlying prosocial behavior is likely facilitated by the advancements in infants' cognitive, self-regulatory and other abilities during the second year of life (Decety & Meyer, 2008).

Our findings regarding the presence of affective concern for others during the first year of life extend prior work on young infants' social understanding. Studies have shown that at 5–6 months, infants can already infer others' goals and intentions based on their actions (e.g., Kamewari, Kato, Kanda, Ishiguro, & Hiraki, 2005; Woodward, 1998). In addition, by 9-months, and in some studies even earlier, infants can distinguish between intentional and non-intentional actions of others (e.g., Behne, Carpenter, Call, & Tomasello, 2005; Woodward, 1999). The present study extends this body of work by showing that young infants' understanding of the internal states of others also includes their ability to comprehend others' emotional states – at least that of distress – and to respond to them with emotional attunement. Our results may also be relevant to recent findings regarding young infants' prosocial preferences. Hamlin, Wynn, and Bloom (2007) showed that 6- and 10-month-olds prefer a helping character over a hindering one. It is possible that early signs of concern for a needy or distressed other may be implicated in these early prosocial preferences. Empathic concern is an important motivator of prosocial behavior in young children (e.g., Eisenberg et al., 2006). It remains to be examined whether it also plays a role in young infants' early social evaluations of others' prosocial (and disruptive) actions.

With respect to our second research question, concerning empathic self-distress, we found that self-distress responses to the distress of another (e.g., fear, whimpering, crying) were very rare in our study in general, and particularly at 8- and 10-months. These findings are consistent with Hay et al.'s (1981) findings with 6-month-olds, yet differ from Geangu et al.'s (2010) study, which showed contagious crying to be still characteristic at 6- and 9-months. This seeming contradiction can be resolved however, when considering the nature of the distress stimuli that have been used in the different studies. We maintain that concern is most likely to be shown when the other's distress is unambiguous, yet not too overwhelming. This is because the characteristics of the distress stimulus affect the infant's emotion regulation process, which has been shown to play a key role in empathy (e.g., Davidov & Grusec, 2006; Eisenberg et al., 1998, 2006). Distress that is very mild or vague

is unlikely to induce sufficient arousal, whereas distress that is highly intense or stressful can lead to over-arousal and thus to a self-distress response. In the present study infants were exposed to clear episodes of distress, but this distress was of moderate intensity, and was experienced for relatively short periods and in a familiar environment. Therefore, many of the infants, even before the second year, were able to regulate their empathic arousal effectively – they were emotionally affected yet remained other-focused, showing social interest and concern. In the contagious crying studies, in contrast, infants were exposed to intense stimuli of distress, for much longer periods, typically in an unfamiliar environment (e.g., Geangu et al., 2010; Simner, 1971). This could have increased the likelihood of emotional dysregulation and thus of a self-distress (contagious crying) response.

The level of vicariously induced arousal and the ability to regulate it effectively are influenced not only by features of the immediate situation. They are also the subject of individual differences, which were the focus of our third research question. Ungerer et al. (1990) found that early individual differences in self-regulation predicted infants' responses to another's distress at 12-months. Infants who showed poorer self-regulation in a still-face episode at 4-months were more likely to subsequently show distress (assessed through sucking behavior) in response to another infant's distress. Extending this work, the current study was the first to examine individual differences in empathy during the first year of life (8- and 10-months) as predictors of subsequent prosocial responding. The results showed that the level of cognitive and affective empathy assessed in the first year, particularly at the 10-month assessments, was consistently linked to greater prosocial behavior in the second year. This indicates that early individual differences in empathy are meaningful predictors, possibly because they reflect relatively stable self-regulatory skills (Ungerer et al., 1990). Knafo et al. (2008) found compelling evidence for empathy as a stable disposition between the ages of 14 and 36 months. The current study suggests that this stable disposition may be evident even prior to the second year of life.

Individual differences in early empathy are likely affected by a variety of factors, including infants' temperamental characteristics (e.g., sociability, irritability, regulation) (Volbrecht et al., 2007; Young et al., 1999) and experiences with parents and other caregivers (e.g., how parents typically respond to the child's distress) (Davidov & Grusec, 2006; Eisenberg et al., 2006; Kiang et al., 2004; Kopp, 1989). The interplay among temperamental, parenting, and other factors in predicting individual differences in infants' empathic responding during the first year of life is an essential direction for future research.

Our final research question dealt with possible gender differences. In our study, female infants did not show significantly more empathic concern, hypothesis testing or prosocial behavior than did male infants. It may be that we did not find such differences due to the relatively small sample size. Or it may be that gender differences are not consistent in the first years of life. Although several studies of young children have found differences (e.g. Knafo et al., 2008; Volbrecht et al., 2007; Zahn-Waxler, Radke-Yarrow, et al., 1992; Zahn-Waxler, Robinson, et al., 1992), others have not (e.g. Vaish et al., 2009). More consistent gender differences (favoring girls) have been found with older children (Eisenberg & Fabes, 1998; Eisenberg et al., 2006). Thus, gender differences in empathy may become more prominent following the transition to middle childhood, as children internalize societal expectations regarding gender role and gender identity through social learning processes, and act in accordance with them.

The present study has several limitations. First, it was an exploratory investigation, using a relatively modest sample size ($n = 37$). The findings should therefore be interpreted cautiously and replications with larger samples are greatly needed. In addition, the current sample was homogenous, comprised mostly of middle- to upper-class European-American families. This renders the generalizability of the findings to more socioeconomically and culturally diverse samples uncertain. Future studies should therefore employ more diverse samples.

Nevertheless, we believe the current findings have implications for future research on empathy development. The findings highlight the need to study the development of concern for others during the first year of life. It is important to begin such observations at even younger ages than in the current study, in order to fully document the early developmental course of concern for others. Future investigations should also examine empathic responding in additional contexts, such as with fathers, siblings, or present peers. In addition to studying typically developing infants, the development of empathy in the first year of life in clinical and at-risk populations should also be examined. As noted earlier, other interesting avenues for future research involve examining the contribution of child, parents, and other environmental characteristics to early individual differences in concern for others, as well as how these early differences predict subsequent prosocial development and social functioning. Finally, examining empathic responding to emotional states other than distress would also be of great interest, such as the developmental course and individual differences in empathy for another's positive emotions (e.g., joy), or different negative emotions (e.g., anger, disgust).

This research may also have applied implications for the early detection of conditions associated with deficits in empathy. Certain developmental disorders, such as autism spectrum disorders and conduct disorder, involve deficiencies in empathic responding, albeit for different reasons (Blair, 2005; Decety & Meyer, 2008; Oberman & Ramachandran, 2007; Preston & de Waal, 2002). Systematic knowledge regarding the early manifestations of empathy could be used to develop early screening procedures for such conditions, which are currently identified and diagnosed only later in the child's life.

In conclusion, despite its limitations, we believe that this study sheds new light on the early development of empathy, a central feature of healthy social life. Most importantly, it suggests that other-oriented empathy may be evident earlier than has been assumed, and points to the need to examine the development of concern for others during the first year of life.

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