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RESEARCH ARTICLE

Less attention to emotional faces is associated with low empathy and prosociality in 12-to 20-month old infants

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Abstract

The development of empathy and prosocial behavior begins in infancy and is likely supported by emotion processing skills. The current study explored whether early emerging deficits in emotion processing are associated with disruptions in the development of empathy and prosociality. We investigated this question in a large, diverse sample of 147, 11- to 20-month-old infants (42% female; 61% Black; 67% low socioeconomic status). Infants completed two observational tasks assessing prosocial helping and one task assessing empathy and prosocial comforting behavior. Infants also completed an eye-tracking task assessing engagement and disengagement with negative emotional

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faces. Infants who attended less to angry, sad, and fearful faces (i.e., by being slower to look at and/or quicker to look away from negative compared to neutral faces) engaged in fewer helping behaviors, and effect sizes were larger when examining infants' attention toward the eye regions of faces. Additionally, infants who were quicker to look away from the eye regions of angry faces, but not the whole face, displayed less empathy and comforting behaviors. Results suggest that as early as 12 months of age, infants' decreased attention toward negative emotional faces, particularly the eye regions, is associated with less empathy and prosociality during a developmental period in which these abilities are rapidly maturing.

1 | INTRODUCTION

Empathy and prosocial behavior begin to develop in infancy (Dahl et al., 2022; Davidov et al., 2021; Donohue et al., 2023; Roth-Hanania et al., 2011) and are critically important skills for young children to develop, as they are associated with competence in peer relationships (Eisenberg & Fabes, 1998) and are protective against externalizing problems (Hastings et al., 2000). Children who display low empathy and prosociality, such as children with high levels of callous-unemotional (CU) behaviors, have been found to display deficits in attending to and recognizing emotional faces (Peltola et al., 2018; Rajhans et al., 2016). However, studies have not examined whether altered attention to emotional faces is associated with low empathy and prosociality in infancy, a developmental period in which empathic and prosocial skills are rapidly developing and may be most malleable. The purpose of this study was thus to examine associations between attention to emotional faces and empathy and prosociality in 12-to 20-month-old infants.

Empathy and prosocial behavior emerge in infancy and develop rapidly across the first years of life. Infants as young as 3 months of age display empathic concern (Davidov et al., 2021), and by 12 months engage in prosocial *helping* (i.e., helping another achieve a goal, such as obtaining an out-of-reach item (Dahl et al., 2022; Donohue et al., 2023) and *comforting* behaviors (i.e., engaging in prosocial behavior in response to another's emotional distress; Davidov et al., 2021; Roth-Hanania et al., 2011). This early development of empathy and prosocial behavior relies, at least in part, on the ability to recognize and respond to others' goals, intentions, and emotional states (Köster et al., 2019). Studies of normative emotion processing abilities have demonstrated that infants have an attentional bias toward faces (Leppänen, 2016) and can distinguish between different emotions (Flom & Bahrick, 2007). These early emotion processing skills theoretically aid empathic and prosocial development; indeed, attending to and recognizing another's emotion is thought to activate an individual's own representation of that emotion through perception-action coupling, which can in-turn lead to facial mimicry, emotional contagion, and further orientation toward salient behavioral cues (de Waal & Preston, 2017; Decety & Jackson, 2004). In contrast, difficulties in processing others' emotions are thought to inhibit empathic and prosocial development. Taken together, the prior literature indicates that empathy and prosocial behavior develop early in infancy and that emotion processing skills may play a key role in their development; however, it is unclear whether early emotion processing skills are associated with the concurrent development of empathy and prosocial behavior in infancy, when these moral emotions and behaviors emerge. Identifying atypical processing of emotional faces as a correlate of low empathy and prosocial behavior in infancy could identify altered emotional processing as a possible early intervention target to prevent empathic and prosocial deficits.

Most of the evidence for associations between emotion processing deficits and low empathy and prosociality comes from research on individuals with CU behavior—a multidimensional construct composed of low empathy, low prosociality, and low guilt behaviors reflecting developmentally atypical levels of morality (Waller et al., 2020). CU behaviors begin to develop in infancy, when empathic and prosocial development is occurring (Wakschlag et al., 2018), and as early as age 3, CU behaviors are concurrently associated with more severe conduct problems and impairment (Ezpeleta et al., 2013; Hyde et al., 2013). In the present study of largely 12-month-old infants, we focus on two of the three components of the CU behaviors construct—low empathy and prosociality—as guilt has not been demonstrated to emerge until around 18 months (Kochanska, 2002). Research suggests that children and adolescents with high CU behaviors display difficulties in attending to and identifying emotional face stimuli. Whereas CU behaviors across youth have most commonly been associated with deficits in recognizing fear (Dadds et al., 2008; White et al., 2016), a meta-analysis by Dawel et al. (2012) found evidence that school-aged children and adolescents with high levels of CU behaviors have broader emotion recognition deficits across fear, sadness, and anger, with fear demonstrating the largest effect. In contrast, the meta-analysis found no evidence for an emotion recognition deficit specific to positive (e.g., happy) emotions. This meta-analytic evidence is in line with theory that neurocognitive deficits in processing others' negative emotions may be a mechanism through which CU behaviors develop, as children who do not easily detect others' distress are less likely to find this distress aversive, leading to disrupted conscience development and callousness (Blair, 2013; van Goozen, 2015).

The few studies to examine associations between emotion recognition deficits and CU behaviors in very young children have found that higher parent-reported CU behaviors were associated with emotion recognition deficits, though study findings have differed regarding whether these deficits were specific to fearful faces (White et al., 2016) or evidenced more globally (Kimonis et al., 2016). These findings linking CU traits to decreases in negative emotion recognition are particularly impactful when considering that even young children have typically been shown to display a negativity bias in which negative information is attended to, learned, and used to a *greater* degree than positive information (see Vaish et al., 2008 for a review). For example, attentional biases to threat typically develop between 5 and 8 months of age (Leppänen & Nelson, 2012), evidenced by behaviors such as infants taking a longer time to disengage from fearful relative to happy faces (Leppänen et al., 2018) and faster orientation to angry relative to happy faces (LoBue & DeLoache, 2010). Thus, even if contexts in which deficits in emotion detection were found, we might expect those deficits to be attenuated, not amplified, for negative emotions—even in infancy.

In sum, though the findings are mixed, most studies appear to suggest that children with high CU behaviors have pervasive deficits in the recognition of several negative emotions, and that the effect may be largest for fearful emotion. Compared to the literature linking emotion recognition deficits to CU behaviors, fewer studies have examined associations between CU behaviors and attention toward emotions, despite evidence that reduced attention toward faces (including emotional faces) has been associated with poorer emotion recognition (Kliemann et al., 2010) and social competence (Jones et al., 2008). However, there is evidence that young children displaying low prosociality or high levels of CU behaviors display decreased preferential attention to face stimuli even very early in life (Bedford et al., 2015; Peltola et al., 2018). For example, 5-week-old infants who displayed a lower preference for tracking faces (compared to tracking objects) evidenced higher levels of CU behaviors at age 2.5 years

(Bedford et al., 2015). In this study, an examiner rated children's apparent preference for tracking faces following an observational task; few studies of young children have examined attention to emotional faces using eye-tracking methodology, which allows for more precise measurement of eye gaze. In one eye-tracking study, preschoolers who exhibited slower orienting toward fearful faces (but not happy faces) engaged in less observed prosocial behavior (Rajhans et al., 2016). However, it is unclear whether this finding extends to attention toward other negative emotions such as sadness and anger, as they were not measured. In another study, 7-month-old infants who exhibited decreased attention to faces compared to non-face patterns displayed decreased observed prosocial helping behaviors at age 2 and increased CU behaviors at age 4 (Peltola et al., 2018). Taken together, these findings suggest that decreased attention to faces is associated with low prosociality and high CU behaviors in young children, but whether this finding is specific to attention toward certain emotions and whether these processes are evident as early as infancy remains unclear.

Additional work has focused on whether children with CU behaviors display decreased attention specifically to the eye regions of emotional faces, with potential downstream implications for poor emotion recognition. For example, children with high CU behaviors look at the eyes of emotional faces less often or for shorter durations than children with low CU behaviors (Dadds et al., 2008; Demetriou & Fanti, 2022). Moreover, research using naturalistic tasks found that children with high CU behaviors made less eye contact with their parents, indicating that this effect has external validity (Dadds et al., 2011). There is also evidence that decreased eye looking may be related to fear recognition deficits in children with high CU behaviors. In one set of studies, experimental and real-world eye looking was positively associated with fear recognition in children with high CU behaviors (Dadds et al., 2008, 2011), and cueing children with high CU behaviors to look at eyes specifically improved their fear recognition performance (Carter Leno et al., 2022). However, not all research has found associations between high CU behaviors and reduced eye looking (e.g., Hartmann & Schwenck, 2020), suggesting a need for additional research on this topic. Moreover, studies linking CU behaviors with reduced eye looking have examined school-aged children and adolescents, leaving the developmental timing and origins of this relationship unknown.

In sum, research is needed that identifies how early in development altered attention to negative emotional faces is associated with low empathy and prosociality—two of the three components of CU behavior that are measurable in infancy—and clarifies which specific emotions and regions of emotional faces are implicated in these associations. Such information is needed to inform the design and timing of the earliest possible preventive interventions. It can also inform a broader understanding of how looking behavior and attentional patterns in early life might relate to psychopathology and other outcomes later in life. The current study examines associations between engagement and disengagement with negative emotional faces measured via an eye-tracking task and low empathy and prosociality, assessed via observational helping and comforting prosocial tasks in infants as young as 12-months of age. Meta-analytic evidence indicates that children with high CU behavior display emotion recognition deficits specific to anger, sadness, and fear, with fear demonstrating the largest effect, and no evidence for a deficit specific to positive emotions (Dawel et al., 2012). One study published since this meta-analysis similarly found that preschoolers who displayed less observed prosocial behavior exhibited slower orienting toward fearful faces, but not toward happy faces (Rajhans et al., 2016). Moreover, the observational helping and comforting tasks in the present study involve adults expressing negative emotional states, requiring infants to attend to these emotions to identify the adult's problem or need, and as such, infants' processing of others' negative emotions are particularly relevant to their responses on these tasks. Thus, based on the best available evidence, theory, and methodological considerations, this study examines infants' attention toward angry, sad, and fearful emotional faces, specifically. Based on the prior literature, we hypothesized that infants who were less attentive to negative emotional faces would display less empathy and prosocial behavior, and that these effects may be strongest for infants' attention toward fearful faces and to the eye regions of faces.

2 | METHOD

2.1 | Participants

Participants included a subset of the 399 mother-infant dyads recruited during pregnancy as part of an ongoing, longitudinal study called the Early Life Adversity, Biological Embedding, and Risk for Developmental Precursor of Mental Disorders (eLABE) study. Participants were recruited from two outpatient obstetrics clinics at [Washington University School of Medicine] University if they met the following inclusion criteria: English-speaking, singleton pregnancy, maternal age 18 years or older, no fetal congenital abnormalities, and no alcohol or substance use during pregnancy (except tobacco or marijuana).

The present analysis examined data collected at infants' 12-month study visit between 10/2018 and 10/2021. Due to the COVID-19 pandemic, 238 infants (of 399) came into the laboratory for an in-person visit; of these infants, 147 had usable data on both the eye-tracking and at least one morality task. Reasons for missing data in the other 91 infants by task are detailed in Supplement 1 and Tables S1 and S2. Infants excluded from the current study due to missing data were significantly younger than included infants ($t = -2.39$, $p = 0.02$) but did not significantly differ on sex, income-to-needs, or cognitive ability (all $p > 0.05$; see Table S3). On average, infants were 13.44 months old ($SD = 2.33$; 42.2% female). The study initially aimed to conduct the 12-month visit when all infants were 11-to 13 months. However, due to COVID-19 related study delays, 33 infants (22.4%) completed the assessment between 14-to 20-months of age. Parents identified infants' race as Black ($n = 90$), White ($n = 54$), Chinese ($n = 1$), Asian Indian ($n = 1$), Pacific Islander ($n = 1$), and Other ($n = 1$). The cohort was oversampled for low SES and 66.7% of families had an income-to-needs ratio of <2.

2.2 | Procedure

All study procedures were approved by [Washington University School of Medicine] Review Board and conducted in compliance with the approved protocol. Written informed consent was obtained from the mothers at the beginning of the Year 1 visit. During the 3 h lab visit, infants completed the Bayley-III, followed by three morality tasks and the eye tracking emotional engagement task. Tasks that were part of the larger eLABE study were interspersed throughout the visit (e.g., parent-child interactions). The morality tasks were administered in a fixed order and consisted of two prosocial helping tasks (balls, blocks) that were administered by a trained experimenter, and one comforting task that was administered by the infants' caregiver. During the helping tasks, caregivers received training on the comforting task by watching a training video (explanation and task demonstration) on a tablet with headphones, to ensure the infant did not overhear. Following the comforting task, infants completed the eye tracking task following the procedures detailed below.

2.3 | Covariate measures

Select measures from the broader eLABE study are included here as covariates in analyses.

2.3.1 | Income-to-needs

To measure SES in the sample, an income-to-needs ratio was calculated by dividing mother-reported annual family income by the Federal Poverty Level based on family size. In the current study, income-to-needs ratios were averaged across four timepoints based on infant's age: birth, 4 months, 8 months, and 12 months.

2.3.2 | Bayley-III scales of Infant development

The Bayley-III, a validated assessment consisting of three subscales and commonly used to diagnose developmental delays in infants and young children, was administered at the Year 1 visit. The cognitive subscale was included as a measure of general cognitive ability; higher scores indicate greater cognitive ability.

2.4 | Measures

2.4.1 | Morality tasks

These tasks were first reported in (Donohue et al., 2023).

Helping tasks

The balls and blocks tasks were modeled on established “out of reach” paradigms (e.g., Warneken & Tomasello, 2007) and adapted for infants as young as 11-months of age. Each task consisted of three trials with each trial consisting of a familiarization and test phase. In the balls task, the infant was seated in a highchair across the table from an experimenter with a clear box between them (see Figure 1). During the familiarization, an assistant placed three balls in front of the experimenter. The experimenter picked up each ball, said “Look”, and placed the ball in the box. During the 45s test phase, the assistant placed three balls in front of the infant. The experimenter exclaimed, “oh!” and reached out her hand toward the balls (and next to the box). Following 20s of reaching, the experimenter gave progressively stronger cues that she needed help for the remaining 25s, first saying, “the ball,” then “I can't reach,” and finally, “Can you help?”. Each trial ended when the infant helped retrieve all three balls, or 45s elapsed. The same procedure was repeated for the remaining two trials, with the location of the box and hand (left vs. right) counterbalanced across trials.

The blocks task followed a similar format. For the familiarization, the experimenter slowly placed three blocks, one at a time, onto a short stack of blocks located near the infant (see Figure 2). Then the experimenter went to place the fourth block but instead dropped it next to the stack. The experimenter immediately exclaimed “oh!,” and reached out her hand next to the stack while making small reaching movements toward the dropped block. The 45s test phase began once the experimenter's hand was in position and followed the same progression of cues as the balls task. This procedure was repeated for the remaining two trials, with the location of the stack and hand again counterbalanced across trials.

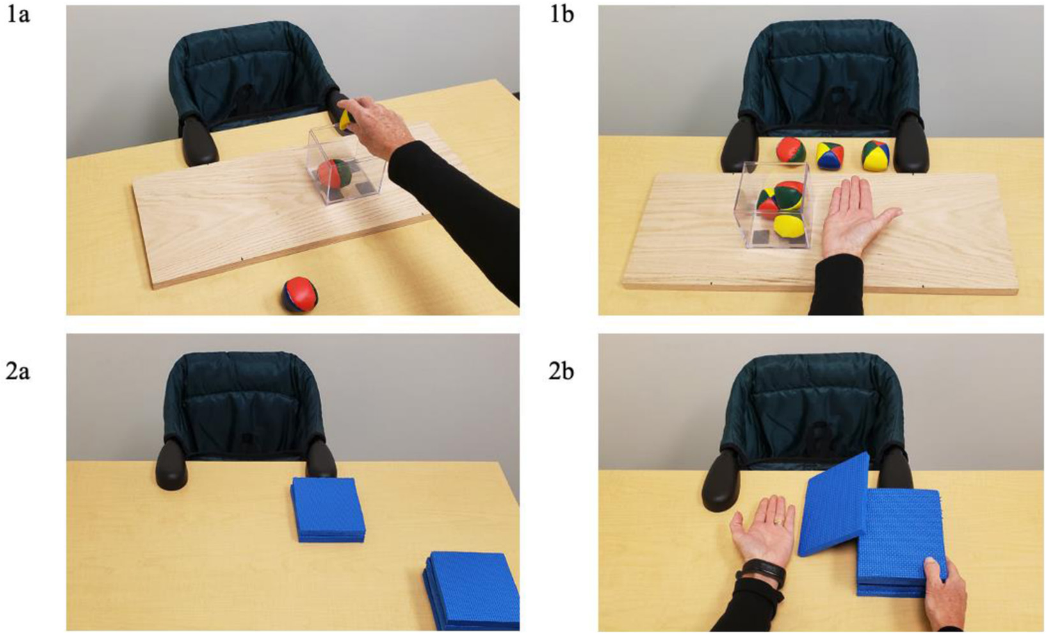

FIGURE 1 Depiction of familiarization and test phase for the balls (1a, 1b) and blocks (2a, 2b) tasks.

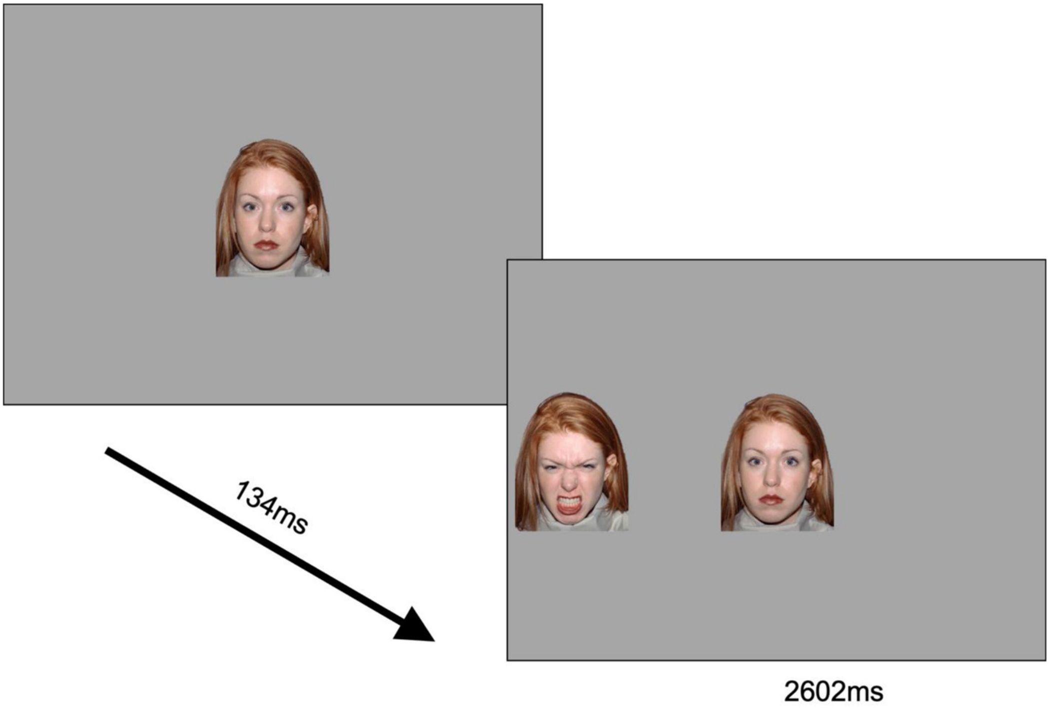

FIGURE 2 Eye Tracking Task Trial structure. Center faces (emotional or neutral) were presented at the trial onset, followed by the peripheral face on the right or left 134 ms later. Both faces remained on the screen for 2.602 s.

The current study assessed infants' helping toward an unfamiliar experimenter rather than their parent because this is standard in research examining infants' helping behaviors (Dahl et al., 2022; Köster et al., 2019; Sommerville et al., 2013) and, importantly, our tasks needed to be highly standardized in terms of details such as counterbalancing the side that objects were presented, presenting the distance of items from the infant, and following exact timing of giving the progressive verbal cues. We therefore chose to train experimenters on the procedure to maintain better fidelity of administration over time.

Comforting task

The comforting task followed widely used tasks designed to assess empathy and comforting behaviors in infants and toddlers. In the task, the caregiver pretended to injure her knee, and infants' affect and behavior in response to caregiver distress were subsequently coded from video. When the experimenter left the room, the parent pretended to bump her knee on a table. The parent followed a short script immediately after the injury: "Ow! I banged my knee. It really hurts." Throughout the entire incident (30s), the parent pretended to be in pain by rubbing her finger and using pained facial expressions and tone of voice. The experimenter re-entered the room, cueing the caregiver to pretend to recover by saying, "I feel better now." The current study assessed infants' empathic and prosocial responses to their mother's rather than an experimenter's distress because historically and to date, comforting tasks typically assess children's responses to their mother's rather than an experimenter's distress (Roth-Hanania et al., 2011; Zahn-Waxler et al., 1979) and there is also some evidence that young children are more empathic to their mother than an experimenter's distress, potentially increasing the variability of our measures (Young et al., 1999).

2.5 | Coding & scoring

All behaviors were coded from video by a team of coders blind to family demographics (e.g., income-to-needs) and trained to reliability, with 50% of videos coded by two individuals. Cohen's kappas (**K**) were calculated for dichotomous codes and two-way mixed intraclass correlation coefficients (ICC) were calculated for continuous codes. Reliability estimates were in the good to excellent range for all variables.

Helping Tasks. Across both balls (**K** = 0.95) and blocks (**K** = 0.95), helping was scored if the infant either handed the object to the experimenter or placed the object in the goal location (i.e., in the box or on the stack). The infant received a score of 1 if they helped at any point during the trial, and a score of 0 if they did not. A composite *helping score* was then calculated as the proportion of trials (out of 6 possible) in which children helped across balls and blocks tasks—in other words, the number of trials in which children helped divided by the number of usable trials. Infants had to have at least 3 usable trials for this variable to be calculated.

Comforting. Emotions/behaviors were each coded on a 4-point scale based on duration, intensity, and complexity, adapted from published coding schemes used in infants (Davidov et al., 2021; Roth-Hanania et al., 2011).

Affective empathy (*ICC* = 0.65) captured other-oriented empathic concern for the victim based on facial, vocal, and/or gestural-postural manifestations on which 0 = *absent*; 1 = *slight* (some concern expressed in face or voice, e.g., brow furrow, but relatively fleeting or slight); 2 = *moderate* (prolonged brow of eyes or vocalizations expressing concern or sadness) and 3 = *substantial* (sustained—i.e., the majority of the episode—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).

Cognitive empathy (*ICC* = 0.60) captured infants' information seeking behaviors that indicated that the child was attempting to explore the distress and/or comprehend cognitively what was happening to the victim on which 0 = *absent*; 1 = *slight* (brief non-vocal or vocal exploration about distress; e.g., non-vocal: touches own body part analogous to victim, looks back and forth from victim's face to hurt knee, looking very intently; e.g., vocal: vocalization with a questioning intonation, repeating mother's pain expressions, or saying words with a questioning intonation); 2 = *moderate* (same as slight but non-vocal or vocal manifestations are prolonged OR infant displays one or more moderate attempts, OR infant displays looking intently plus at least one clear verbal attempt) and 3 = *substantial* (repeated and/or relatively sophisticated attempts to understand the distress, combining both verbal and non-verbal attempts).

Prosocial behavior (*ICC* = 0.88) captured infants' attempts to help or comfort the victim (e.g., hugging mother; touching/patting/rubbing her knee) were rated on a 4-point scale, with 0 = *none*, 1 = *slight assistance* (one brief/fleeting behavior or verbalization); 2 = *moderate assistance* (assists for 3–5s, or verbalizes prosocially more than once); and 3 = *prolonged assistance* (assists for more than 5s). There was one difference between our scheme and that published in Roth-Hanania et al. (2011): because infants in our study were confined to a chair, reaching behaviors were potentially considered as prosocial behavior—only if it appeared as though the infant was attempting to touch the mother but could not reach due to their seating. Note that behaviors were considered comforting behavior *only* if they appeared motivated by other-oriented concern; thus, behaviors that appeared to stem from the infant's self-distress were not coded as comforting behaviors. Affective empathy, cognitive empathy, and prosocial behavior scores were averaged to create a composite measure of *empathy and comforting behavior*.

2.6 | Eye tracking emotional engagement task

Infants completed a modified version of the Eye Tracking Emotional Engagement Task (Nakagawa & Sukigara, 2012). This task consisted of 18 2.74 s trials. Each trial started with a face in the center of the screen, followed by a face to the left or right of the central face 134 milliseconds later. Both faces then remained on the screen for 2.62 s before disappearing. Previous findings support that 134 ms is a sufficient length of time to capture both fixation as well as infants' individual differences in processing of faces. First, a fixation is typically defined as 100 ms, and previous papers have published this fixation length in infancy (see Reider et al., 2022), demonstrating that infants are able to fixate on a face in that length of time and display different attentional patterns. Second, ERP studies have demonstrated differential processing of faces as soon as 100 ms after face stimulus presentation. This is reflected in the P1 amplitude which occurs 100 ms after the stimulus in children (Thai et al., 2016) and infants (Di Lorenzo et al., 2020) and is associated with more automatic attentional processing. Between trials the experimenter showed attention-grabbing stimuli (such as Baby Shark) as needed to draw the child's attention back to the screen. Face stimuli were from one of two female actors (one Black/African American, one White/European American) selected from the NimStim set (Tottenham et al., 2009) and included happy, neutral, fearful, angry, and sad faces. Emotional faces were always presented with a neutral face from the same actor a total of four times (2 peripheral and 2 center; 2 trials with stimuli from each actor), with the location of the peripheral evenly split between left and right (2 trials each). These procedures resulted in 2 trials for each emotion measuring engagement (emotional face is in the peripheral location that appears after a neutral central face is presented) and disengagement (emotional face is in the center position and presented first, followed by a neutral face presented in the periphery). Participants were randomly assigned to one of two task versions that differed on the location of the peripheral stimulus (left or right) for each emotion-actor-location combination. A schematic of the task is shown in Figure 2. Since previous research found differences in attending to negative faces in children with CU behaviors, we also examined infants' attention toward negative emotion faces in this study.

2.7 | Eye-tracking acquisition and procedures

Stimuli were presented at 1200 × 800 resolution on a screen set at 60 cm away from the child's face. Eye tracking was acquired using a Tobii Pro Spectrum, which uses pupil and corneal reflection of light to detect gaze location for each eye at a rate of 120 Hz. Data were acquired using laboratory procedures developed for successful participation of infants and young children. Specifically, children were acclimated to the eye-tracking room before being buckled into a highchair and the lights turned off. The Emotional Engagement Task was then administered using the Tobii Pro Lab software (Tobii Technology). First, the experimenter played an attention-grabbing video to draw the child's attention to the screen. Next the 5-point eye-tracking calibration sequence included in the software was administered and repeated as needed until an acceptable level of accuracy was reached per software default settings. Finally, the task was administered as detailed above.

2.8 | Eye tracking data processing

For each infant, trials with at least 50% of valid gaze measures for both eyes (using the native software metric) were considered for analysis. A gaze measure was considered valid if the left and right eyes were detected. Areas of interest (AOIs) were drawn as rectangles over the face images using the Tobii Pro Lab software. Face AOIs were pre-programmed before data collection, with Tobii software's automatic hit/non-hit calculations used for data extraction. The eye AOIs were created post-hoc, thus coordinates for these AOIs and computed hits/non-hits from the raw gaze data were taken for each trial using a Matlab script. Face AOI boxes were 326 × 338 pixels and eyes 120 × 48 pixels. For each valid trial, time to first fixation (TTFF), duration of first fixation, total fixations, and total dwell time were computed for each AOI. For peripheral AOIs, times were computed from the stimulus onset rather than the start of the trial. Mouth AOIs were not examined, as ns for valid trials were quite low (<40). Obtaining a relatively lower number of valid trials for mouth AOIs is in line with prior research demonstrating that 12-month-old infants spend the largest proportion of time looking at eyes of static faces (Oakes & Ellis, 2013), with a shift to looking at mouths over eyes occurring around 18 months of age (Frank et al., 2012). Mean emotion face TTFF scores were not significantly correlated with calibration accuracy, calibration precision, or percent of overall valid trials ($rs<|0.18|$).

Engagement and Disengagement bias scores were computed for each emotion relative to neutral using a similar approach to other comparable eye-tracking paradigms (e.g., Kataja et al., 2019; Tuulari et al., 2020). Specifically, Engagement was the TTFF to the emotional face in the periphery when the neutral face was in the center, and Disengagement was the TTFF to the peripheral neutral face when the emotional face was in the center. The comparison to neutral face stimuli is consistent with the approach frequently taken in the eye tracking literature on infant emotion processing (e.g., Thrasher et al., 2021; Vallorani et al., 2021). To calculate the bias scores, first, Engagement and Disengagement average TTFF measures were z-scored within each infant. This procedure removes individual differences in saccade speed (likely related to motor development) while preserving magnitude differences in TTFF between emotion categories. Analyses of the effects of z-scoring (e.g., in reducing associations between TTFF and age) are included in Supplement 2. Finally, bias scores were computed by subtracting the emotion engagement/disengagement z-scored TTFF from neutral engagement/disengagement z-scored TTFF, resulting in a total of 6 bias measures for further analysis (3 emotions: fearful, sad, and angry x 2 scores: engagement, disengagement). Lower bias scores indicate quicker engagement with or disengagement from the emotion face relative to neutral. It is worth noting that we explored the data to examine whether we should treat all negative faces as the same type and employ a repeated measures analysis. In this study, we do not find evidence that the infants looked at any negative face more similarly to the other negative faces compared to the happy or neutral faces (Supplement 2.2, Figures S5–S10). We therefore did not find it appropriate to treat the negative faces as repeated measures in our dataset.

2.9 | Analytic approach

Analyses of study hypotheses examined whether measures of engagement with the (1) whole face and (2) eye regions of negative emotional faces were significantly associated with children's helping behaviors and/or empathic emotions and comforting behaviors. First, two separate sets of multiple linear regression analyses (with 6 regressions per set) examined each of the six eye-tracking variables (using the whole face region as the AOI) as a predictor of each of the two study outcome variables—(1) helping across the balls and blocks tasks; and (2) empathy and comforting behaviors on the comforting task. Second, two additional separate sets of multiple linear regression analyses examined each of the six eye-tracking variables (using the eye regions as the AOI) as a predictor of each of the two study outcome variables. Although only negative emotions are examined here following prior literature (Dawel et al., 2012), for interested readers, we report findings specific to happy emotions in the supplement. All analyses controlled for infant age at the assessment, income-to-needs (because the sample was enriched for poverty), and infant cognitive ability (to ensure that any significant findings were specific to prosocial and/or empathic skills rather than reflecting general cognitive ability). The Benjamini-Hochberg procedure (Benjamini & Hochberg, 1995) with the false discovery rate (FDR) set at 0.05 was used to control for multiple comparisons within each specific analysis (i.e., each table of Tables 4–7). This method appropriately corrects for multiple comparisons to optimally reduce Type I errors without unduly diminishing statistical power.

2.10 | Transparency and openness

We report how we determined all data exclusions in the study. Data are available upon request to the corresponding author. Data were analyzed using SPSS Statistics, version 27.0.0.0. This study was not preregistered.

3 | RESULTS

3.1 | Preliminary analyses

Due to the presence of premature infants in the sample (n = 19; gestational age range 28–36 weeks), supplemental analyses were conducted to examine the role of prematurity in analyses of study hypotheses, with no change in results (Supplement 3, Tables S4 and S5).

3.2 | Descriptive statistics

Descriptive statistics are presented in Table 1 and correlations among study variables are presented in Tables 2 and 3, with significant correlations detailed here. Specifically, older children were significantly slower to look away from the eye regions of sad compared to neutral faces and engaged in significantly more helping than younger infants, and infants with greater cognitive ability engaged in significantly more helping and displayed greater empathy and comforting behavior. Neither infant sex nor income-to-needs were significantly associated with any variable.

TABLE 1 Descriptive statistics.

	Observed range	Mean (*SD*) or %
Demographics/Covariates		
1. Age (months)	11.01–20.45	13.44 (2.33)
2. Sex (% female)		42.2%
3. Income-to-needs	0.34–9.38	2.19 (2.15)
4. Cognitive ability score	55–135	102.69 (13.83)
Task variables		
Eye-tracking—face AOIs		
5. Anger engagement	−2.59–2.26	−0.53 (1.27)
6. Anger disengagement	−2.02–2.71	0.25 (1.23)
7. Sadness engagement	−2.63–2.27	−0.64 (1.25)
8. Sadness disengagement	−2.57–2.59	0.09 (1.13)
9. Fear engagement	−2.80–2.35	−0.45 (1.41)
10. Fear disengagement	−2.58–2.80	0.62 (1.31)
Eye-tracking—eye AOIs		
5. Anger engagement	−2.66–2.44	−0.36 (1.33)
6. Anger disengagement	−2.39–2.54	−0.02 (1.39)
7. Sadness engagement	−2.33–2.18	−0.52 (1.28)
8. Sadness disengagement	−2.80–2.35	−0.03 (1.22)
9. Fear engagement	−2.82–2.40	−0.26 (1.37)
5. Fear engagement	−2.34–2.57	0.46 (1.23)
Morality variables		
11. Prosocial helping behavior	0–1	0.73 (0.34)
13. Empathy and prosocial comforting behavior	0–2.67	1.27 (0.74)

Associations within the eye-tracking task demonstrated significant negative correlations between each engagement variable for a specific emotion and the disengagement variable for that same emotion (e.g., anger engagement and anger disengagement were negatively correlated) across whole face and eye AOIs. Similarly, across emotions, engagement variables were significantly and positively correlated (e.g., anger engagement was positively correlated with sadness and fear engagement), and disengagement variables were significantly and positively correlated (e.g., anger disengagement was positively correlated with sadness disengagement). On average, infants helped on 73% of helping opportunities, a rate similar in this subsample to the larger sample of infants (Donohue et al., 2023). Infants' helping was not significantly associated with their comforting behavior and empathy, suggesting that these are distinct measures of moral development. Significant correlations between eye-tracking and morality tasks are explored in further detail in analyses of the study hypothesis, below.

3.3 | Analyses of study hypotheses

Across the two helping tasks, infants who were slower to look at and quicker to look away from the whole face region of angry compared to neutral faces engaged in fewer helping behaviors. Additionally, infants who were slower to look at the whole face region of fearful compared to neutral faces engaged in fewer helping behaviors. The associations between anger engagement and disengagement

TABLE 2 Correlations among variables (face AOIs).

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age												
2. Sex	−0.01											
3. Income-to-needs	0.04	−0.09										
4. Cognitive ability	−0.08	0.14	0.01									
Eyetracking—face AOIs												
5. Anger engagement	−0.10	0.03	−0.11	−0.18								
6. Anger disengagement	0.14	−0.13	0.00	−0.02	−0.26*							
7. Sadness engagement	−0.13	0.08	0.03	0.09	0.39*	−0.19						
8. Sadness disengagement	0.09	0.06	−0.04	0.09	−0.33*	0.32*	−0.46*					
9. Fear engagement	−0.13	−0.04	0.09	0.08	0.38*	−0.29*	0.48*	−0.23*				
10. Fear disengagement	−0.01	−0.13	0.01	0.02	−0.24*	0.15	−0.42*	0.40*	−0.45*			
Morality variables												
11. Helping	0.22*	−0.01	−0.01	0.37*	−0.28*	0.23*	−0.03	0.17*	−0.18	0.03		
12. Comforting/Empathy	−0.06	−0.10	−0.10	0.20*	−0.19	0.14	0.05	−0.09	0.00	0.03	0.14	

TABLE 3 Correlations among variables (eye AOIs).

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age												
2. Sex[a]	−0.01											
3. Income-to-needs	0.04	−0.09										
4. Cognitive ability	−0.08	0.14	0.01									
Eyetracking—eye AOIs												
5. Anger engagement	0.01	−0.03	−0.19	−0.10								
6. Anger disengagement	0.18	−0.01	0.09	0.04	−0.37*							
7. Sadness engagement	−0.02	0.04	−0.05	−0.02	0.38*	−0.35*						
8. Sadness disengagement	0.21*	0.04	0.05	0.14	−0.42*	0.32*	−0.46*					
9. Fear engagement	−0.01	−0.00	0.05	0.04	0.41*	−0.41*	0.48*	−0.30*				
10. Fear disengagement	−0.02	−0.13	−0.12	0.05	−0.33*	0.35*	−0.41*	0.39*	−0.51*			
Morality variables												
11. Helping	0.22*	−0.01	−0.01	0.37*	−0.25*	0.36*	−0.08	0.20*	−0.14	0.18		
12. Comforting/Empathy	−0.06	−0.10	−0.10	0.20*	−0.15	0.28*	−0.09	−0.21	−0.03	0.11	0.14	

[a]Sex is coded as 1 = male; 2 = female.

TABLE 4 Associations between emotional engagement to face regions and overall helping on the helping tasks.

	B	SE	*ß*	*t*	*p*	*FDR p*
Intercept	−0.679	0.292		−2.321	0.022	
Age	0.001	0.000	0.265	3.073	0.003	
Income-to-needs	0.000	0.014	−0.003	−0.029	0.977	
Cognitive ability	0.008	0.002	0.331	3.775	<0.001	
Anger-Engagement	−0.060	0.023	−0.226	−2.577	**0.011**	**0.033**
Intercept	−0.845	0.288		−2.934	0.004	
Age	0.001	0.000	0.256	2.952	0.004	
Income-to-needs	−0.002	0.014	−0.014	−0.165	0.869	
Cognitive ability	0.010	0.002	0.409	4.788	<0.001	
Anger-Disengagement	0.062	0.023	0.226	2.630	**0.010**	**0.033**
Intercept	−0.661	0.294		−2.248	0.027	
Age	0.001	0.000	0.301	3.244	0.002	
Income-to-needs	−0.002	0.014	−0.017	−0.180	0.858	
Cognitive ability	0.008	0.002	0.358	3.877	0.000	
Sadness-Engagement	−0.005	0.024	−0.021	−0.226	0.821	0.821
Intercept	−0.739	0.309		−2.395	0.019	
Age	0.001	0.000	0.272	2.967	0.004	
Income-to-needs	0.001	0.014	0.004	0.048	0.962	
Cognitive ability	0.009	0.002	0.363	3.953	0.000	
Sadness-Disengagement	0.040	0.027	0.136	1.482	0.142	0.213
Intercept	−0.797	0.290		−2.745	0.007	
Age	0.001	0.000	0.274	3.117	0.002	
Income-to-needs	0.004	0.014	0.024	0.275	0.784	
Cognitive ability	0.009	0.002	0.374	4.292	0.000	
Fear-Engagement	−0.044	0.021	−0.187	−2.124	**0.036**	0.072
Intercept	−0.756	0.300		−2.518	0.013	
Age	0.001	0.000	0.301	3.356	0.001	
Income-to-needs	0.000	0.014	0.002	0.019	0.985	
Cognitive ability	0.009	0.002	0.352	3.913	<0.001	
Fear-Disengagement	0.014	0.023	0.055	0.611	0.543	0.652

Note: Bolded values are those that were significant ($p < .05$).

and helping behaviors survived following FDR correction (Table 4). When examining infants' engagement and disengagement with the eye AOIs, specifically, there were similarly significant associations between slower anger engagement and quicker anger disengagement and fewer helping behaviors. Moreover, infants who were quicker to look away from the eye regions of both sad and fearful compared to neutral faces also engaged in significantly fewer helping behaviors. All of these associations were robust, surviving FDR correction, and interestingly, effect sizes for significant associations were larger when examining the eye regions compared to the whole face regions (Table 5).

On the comforting task, there were no significant associations between infants' engagement or disengagement with emotional faces and empathy and comforting behavior when examining whole face AOIs (Table 6); however, when examining the eye AOIs, specifically, infants who were quicker

TABLE 5 Associations between emotional engagement to eye regions and overall helping on the helping tasks.

	B	SE	*ß*	*t*	*p*	*FDR p*
Intercept	−0.515	0.301		−1.710	0.090	
Age	0.001	0.000	0.267	2.960	0.004	
Income-to-needs	−0.017	0.015	−0.109	−1.195	0.235	
Cognitive ability	0.007	0.002	0.284	3.135	0.002	
Anger-Engagement	−0.070	0.023	−0.284	−3.099	**0.003**	**0.009**
Intercept	−0.534	0.324		−1.648	0.103	
Age	0.001	0.001	0.208	2.192	0.031	
Income-to-needs	−0.014	0.015	−0.089	−0.947	0.346	
Cognitive ability	0.008	0.002	0.313	3.372	0.001	
Anger-Disengagement	0.080	0.023	0.324	3.443	**<0.001**	**0.006**
Intercept	−0.364	0.333		−1.092	0.278	
Age	0.001	0.000	0.189	1.868	0.065	
Income-to-needs	−0.004	0.014	−0.029	−0.292	0.771	
Cognitive ability	0.007	0.002	0.286	2.823	0.006	
Sadness-Engagement	−0.024	0.026	−0.091	−0.900	0.371	0.371
Intercept	−0.310	0.309		−1.004	0.318	
Age	0.001	0.000	0.207	2.201	0.030	
Income-to-needs	−0.028	0.014	−0.186	−2.030	0.045	
Cognitive ability	0.007	0.002	0.307	3.268	0.002	
Sadness-Disengagement	0.054	0.025	0.212	2.206	**0.030**	**0.048**
Intercept	−0.539	0.299		−1.800	0.075	
Age	0.001	0.000	0.234	2.645	0.009	
Income-to-needs	−0.005	0.014	−0.032	−0.362	0.718	
Cognitive ability	0.008	0.002	0.320	3.613	<0.001	
Fear-Engagement	−0.039	0.021	−0.164	−1.858	0.066	0.079
Intercept	−0.629	0.308		−2.039	0.044	
Age	0.001	0.000	0.233	2.517	0.014	
Income-to-needs	0.000	0.016	0.001	0.015	0.988	
Cognitive ability	0.009	0.002	0.353	3.825	<0.001	
Fear-Disengagement	0.055	0.025	0.202	2.170	**0.032**	**0.048**

Note: Bolded values are those that were significant ($p < .05$).

to look away from the eye regions of angry compared to neutral faces displayed less empathy and comforting behavior, and this association was significant following FDR correction (Table 7). There were no significant effects of engagement or disengagement with happy faces or eye regions of faces and either helping or empathy and comforting behavior (Table S6).

TABLE 6 Associations between emotional engagement to face regions and empathy and prosocial behavior on the comforting task.

	B	SE	*ß*	*t*	*p*	*FDR p*
Intercept	1.311	0.805		1.628	0.107	
Age	−0.001	0.001	−0.085	−0.777	0.439	
Income-to-needs	−0.022	0.042	−0.057	−0.520	0.605	
Cognitive ability	0.003	0.006	0.058	0.521	0.604	
Anger - Engagement	−0.120	0.065	−0.204	−1.841	0.069	0.315
Intercept	1.085	0.798		1.358	0.178	
Age	−0.001	0.001	−0.138	−1.270	0.208	
Income-to-needs	−0.015	0.041	−0.041	−0.378	0.706	
Cognitive ability	0.008	0.006	0.141	1.284	0.203	
Anger - Disengagement	0.105	0.064	0.178	1.638	0.105	0.315
Intercept	1.076	0.836		1.287	0.202	
Age	−0.001	0.001	−0.116	−1.030	0.306	
Income-to-needs	−0.010	0.043	−0.027	−0.240	0.811	
Cognitive ability	0.008	0.006	0.137	1.216	0.228	
Sadness - Engagement	0.013	0.066	0.022	0.195	0.846	0.849
Intercept	1.239	0.849		1.461	0.148	
Age	−0.002	0.001	−0.152	−1.327	0.189	
Income-to-needs	−0.019	0.043	−0.051	−0.441	0.660	
Cognitive ability	0.007	0.006	0.137	1.195	0.236	
Sadness - Disengagement	−0.063	0.074	−0.100	−0.853	0.396	0.792
Intercept	0.985	0.814		1.211	0.229	
Age	−0.001	0.001	−0.102	−0.929	0.356	
Income-to-needs	−0.010	0.042	−0.026	−0.234	0.816	
Cognitive ability	0.008	0.006	0.139	1.257	0.213	
Fear - Engagement	−0.011	0.058	−0.021	−0.191	0.849	0.849
Intercept	0.818	0.813		1.006	0.317	
Age	−0.001	0.001	−0.116	−1.058	0.293	
Income-to-needs	−0.007	0.044	−0.018	−0.161	0.872	
Cognitive ability	0.010	0.006	0.172	1.550	0.125	
Fear - Disengagement	0.036	0.062	0.064	0.577	0.566	0.849

4 | DISCUSSION

The purpose of the current study was to examine associations between infants' attention toward emotional faces and their empathic and prosocial skills. We found that 11-to 20-month-old infants who attended less to negatively valenced emotional faces displayed less empathy and prosocial behavior on three separate observational tasks. Infants who attended less to angry faces (i.e., by being slower to look at and/or quicker to look away from negative emotional faces compared to neutral faces) engaged in fewer prosocial behaviors across two tasks assessing prosocial helping. Infants' attention toward the eye regions of emotional faces was particularly related to their prosocial

TABLE 7 Associations between emotional engagement specific to eye regions and prosocial behavior and empathy on the comforting task.

	B	SE	*ß*	*t*	*p*	
Intercept	1.158	0.777		1.491	0.140	
Age	0.001	0.001	0.060	0.524	0.602	
Income-to-needs	−0.061	0.041	−0.171	−1.486	0.142	
Cognitive ability	0.000	0.006	0.003	0.026	0.980	
Anger - Engagement	−0.112	0.062	−0.207	−1.798	0.076	0.228
Intercept	1.303	0.857		1.519	0.133	
Age	−0.001	0.001	−0.125	−1.094	0.278	
Income-to-needs	−0.048	0.040	−0.135	−1.188	0.239	
Cognitive ability	0.007	0.006	0.134	1.194	0.237	
Anger - Disengagement	0.173	0.060	0.332	2.899	**0.005**	**0.03**
Intercept	1.383	0.854		1.619	0.110	
Age	−0.001	0.001	−0.047	−0.397	0.693	
Income-to-needs	−0.050	0.039	−0.153	−1.281	0.204	
Cognitive ability	0.002	0.006	0.040	0.339	0.736	
Sadness - Engagement	−0.066	0.068	−0.116	−0.974	0.334	0.401
Intercept	0.337	0.907		0.372	0.711	
Age	0.000	0.001	−0.010	−0.082	0.935	
Income-to-needs	−0.022	0.044	−0.059	−0.506	0.614	
Cognitive ability	0.010	0.006	0.200	1.679	0.098	
Sadness - Disengagement	−0.116	0.075	−0.195	−1.548	0.126	0.252
Intercept	0.909	0.816		1.114	0.268	
Age	−0.001	0.001	−0.107	−1.009	0.316	
Income-to-needs	−0.036	0.038	−0.101	−0.953	0.343	
Cognitive ability	0.009	0.006	0.168	1.582	0.117	
Fear - Engagement	−0.027	0.057	−0.050	−0.472	0.638	0.638
Intercept	0.985	0.822		1.199	0.234	
Age	−0.001	0.001	−0.137	−1.255	0.213	
Income-to-needs	−0.026	0.044	−0.066	−0.598	0.552	
Cognitive ability	0.010	0.006	0.177	1.620	0.109	
Fear - Disengagement	0.074	0.064	0.128	1.160	0.250	0.375

Note: Bolded values are those that were significant ($p < .05$).

helping, with eye region associations demonstrating larger effect sizes than whole face region associations. Moreover, infants' lesser attention toward the eye regions of all three negatively valenced emotional faces (i.e., angry, fearful, sad faces) was significantly associated with fewer prosocial helping behaviors. Interestingly, only infants' attention toward the eye regions (rather than whole face regions) was associated with their empathy and prosocial comforting behaviors on a task in which their mothers pretended to be in pain. Specifically, infants who were quicker to look away from the eye regions of angry compared to neutral faces displayed less empathy and comforting behavior.

These findings are consistent with a limited body of research that has demonstrated decreased preferential attention to face stimuli including emotional faces in young children with low prosociality or high levels of CU behavior (Bedford et al., 2015; Peltola et al., 2018; Rajhans et al., 2016). Only the prior study by Rajhans et al. (2016) demonstrated an association between avoidance of fearful faces and low prosociality in preschoolers using an eye-tracking task; our results extend this finding by demonstrating an association between less attention to negatively valenced emotional faces (including not only fearful, but also sad and angry faces) and low empathy and prosociality as early as 12 months of age. Though CU behaviors have been consistently associated with emotion recognition deficits, theories have differed as to whether children with high CU behaviors have specific deficits in the recognition of fear (Blair, 2006) or more pervasive emotion recognition deficits across emotions arising from dysfunction in attentional mechanisms (Dadds et al., 2008). Our results appear to support the theoretical perspective of Dadds et al. (2008) in which problems in directing attention to emotionally salient features of the environment—such as others' facial expressions—contribute to widespread deficits in recognizing others' negative emotions, and, in turn impact emotional response, resulting in increased CU behaviors.

Interestingly, associations between attention toward negative faces and low prosocial helping were strongest when examining infants' attention toward the eye regions of faces, and associations between attention toward negative faces and low empathy and prosocial comforting were only present when examining attention toward the eye regions of faces rather than the whole face regions. Taken together, this pattern of results is consistent with a specific role of eye looking behavior, above and beyond face looking, in the development of prosocial behavior and empathy. In emotion recognition tasks, participants typically spend more time looking at eyes than any other region of the face (Scheller et al., 2012). However, studies have found that children and adolescents with high CU behaviors look less at the eye region of fearful faces, and that this reduced looking contributes to poor fear recognition in these children (Dadds et al., 2006, 2008; Leno et al., 2022). Prior work has also shown that children with high CU behaviors make less eye contact with their parents in naturalistic child-parent dyadic interactions (Dadds et al., 2011), supporting a working hypothesis that CU traits may arise from a failure to attend to caregivers' eyes in early life (Dadds et al., 2008), a behavioral pattern that may then generalize. Although current findings linking eye looking behavior to empathy and prosocial behavior in infancy appear to be consistent with this hypothesis, direct support will require longitudinal studies assessing infants' eye contact with caregivers and measures of CU behavior later in childhood.

Although we found that low empathy and prosociality were associated with less attention toward emotional faces across all three negative emotions studied, associations with angry faces were the strongest. Previous research has shown that whereas children younger than 6 months can differentiate positive from negative emotion cues in others (Flom & Bahrick, 2007), differentiation of negative emotion cues develops across the preschool period (Widen, 2013). While the trajectories for when children differentiate sadness and fear from other negative emotions are not consistent across studies, previous work shows that children as young as 2 years old have a preference for labeling negative emotions as angry (Widen, 2013). Thus, it is possible that children in our study more consistently interpreted the angry faces as angry, while interpretation of the other negative emotions was potentially confused with anger. In children with low empathy and prosociality, this developmental pattern may translate to less sensitivity to negative emotions more broadly, especially for angry faces. Thus, reduced attentional preference to angry faces in infancy may be an early correlate of low empathy and prosociality. Longitudinal studies of attentional preferences are needed to confirm this potential early marker of these components of CU behaviors. Relatedly, future research should examine the extent to which infants' attention toward faces is associated with later autism spectrum disorder, which, like CU, is characterized by atypical attention toward faces. Although studies have actually documented typical or increased attention toward faces in infants who later develop autism (G. S. Young et al., 2009), this future work could help pinpoint common and distinct etiologies of disorders with shared symptoms. Finally, biases toward threatening emotional expressions typically become evident between 5 and 8 months of age (e.g., Leppänen & Nelson, 2012). The present findings of reduced attention to negative emotions in infants displaying less empathy and prosociality raise intriguing questions, including whether this reduced attention to negative emotions at 12 months is reflective of an earlier reduced sensitivity to threat, as decreased threat sensitivity has been described in children with CU behaviors (Waller & Wagner, 2019).

This study had noteworthy strengths and limitations. It was the first study to demonstrate that infants' attention to emotional faces is associated with their empathic and prosocial skills in infancy, as early as 12 months of age. This finding could therefore inform interventions targeting infants' attentional systems to support developing empathic and prosocial abilities at a very early developmental timepoint, when these skills are rapidly developing. Moreover, a unique feature of the current study was its comprehensive observational assessment of empathy and prosocial behavior. Whereas previous studies have typically correlated infants' attention to faces to one type of prosocial behavior (i.e., helping; Peltola et al., 2018), in this study we demonstrated that infants' attention to emotional faces are associated with both helping and comforting subtypes of prosocial behavior as well as their empathic emotions. Thus, our finding supports the idea that infants' lesser attention toward emotional faces may impact the development of several components of developing morality. Finally, our sample was diverse with regard to SES and race, and therefore our findings are likely more generalizable than those relying on mostly White, middle-class samples. Regarding limitations, due to COVID-19, many participants in the longitudinal study were not able to complete their in-person assessment, decreasing the sample size. Second, the static nature of the stimuli in the eyetracking task was an important limitation of this study; future studies should replicate the results using dynamic stimuli. Finally, although the eye-tracking task we used had the same number of trials as previously used, the relatively few trials meant that we had only one useable trial for several children. While we do not have reason to believe that the limited measurement biased our results, future work should seek to collect more trials of data to enhance reliability of findings.

Overall, this study found that 12-to 20-month-old infants who attended less to negative compared to neutral faces on an eye-tracking task displayed lower levels of empathy and prosocial behavior—two of the three components of CU behaviors—on three observational tasks. Thus, as early as 12 months of age, differences in attending to others' negative emotions may be related to infants' developing empathic and prosocial skills, which has implications for identifying children at risk for empathic and prosocial deficits as early as infancy.

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CONFLICT OF INTEREST STATEMENT

The authors report no conflict of interest.

DATA AVAILABILITY STATEMENT

Data and study materials are available upon request to the corresponding author. This study was not preregistered.

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