



Do infants expect others to be helpful?

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This study examined whether infants assume that people will help others to achieve specific goals. Seventeen-month-old infants watched familiarization events in which a competent agent succeeded in climbing hills while an incompetent agent failed to do so. In subsequent test events, the competent agent either helped the incompetent agent reach the top of the hill (helping event) or simply passed the incompetent agent and reached the top of the hill alone (ignoring event). The infants looked reliably longer at the ignoring event than at the helping event. These findings suggest that, by at least the age of 17 months, infants expect a competent agent to help an incompetent agent. Our findings provide evidence that infants in their second year of life possess some expectations of others' prosociality.

Statement of contribution

What is already known?

- Infants begin to reliably produce helping behaviours during their second year of life.
- Infants expect others to help an agent who is in need, not one who is not in need.
- Infants expect others to help, not ignore, another in need when linguistic information explicitly signals that the agent and the recipient belong to the same social group.

What the present study adds?

- Infants expect someone to provide help rather than to ignore another in need under some circumstances with no linguistic information about their social group membership.
- Infants expect an agent to be a helper, not a bystander, even when they lack information about the agent's moral characteristics.

Infants begin to show quite sophisticated helping behaviours during their second year of life. Infants aged 18 to 30 months can assist their parents with household chores (Rheingold, 1982). When 14- and 18-month-old infants watch an experimenter accidentally drop a clothespin while hanging clothes, they are inclined to pick up the clothespin and bring it to the adult (Warnaken, Hare, Melis, Hanus, & Tomasello, 2007; Warneken & Tomasello, 2006). Such helping behaviours occur even when the recipient does not express a request for help (Warneken, 2013). Even younger infants who cannot walk freely display some attempts to help others. On observing that an adult is looking for an object, 12-month-old infants provide the adult with information about the location of the

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object by pointing (Knudsen & Liszkowski, 2013; Liszkowski, Carpenter, Striano, & Tomasello, 2006; Liszkowski, Carpenter, & Tomasello, 2008).

Infants not only engage in their own helping actions but also have some understanding of others' helping actions: infants evaluate helpful agents more positively than other agents. After watching a scene in which an agent was helped by another to fulfil a goal or hindered by the other agent from fulfilling the goal, 6-month-old infants were more likely to reach for an agent who had previously helped another agent than one who had not, suggesting that they preferred the helpful agent (Hamlin, Wynn, & Bloom, 2007). Such infants' own preference for helpful agents in a choice task is consistent with infants' expectations about others' preference for helpful agents in looking-time tasks (e.g., Chae & Song, 2018; Hamlin *et al.*, 2007; Kuhlmeier, Wynn, & Bloom, 2003; Lee, Yun, Kim, & Song, 2015), despite some discrepancies among researchers as to how strong this preference for helpers is in infancy (Margoni & Surian, 2018; Salvadori *et al.*, 2015; Scarf, Imuta, Colombo, & Hayne, 2012).

Previous research has mainly focused on infants' discrimination of helping actions from other actions. Less is known about infants' expectations about others' helping actions. What kind of action would an infant expect of an agent who encounters another agent in need of assistance? More specifically, we questioned whether infants expect one agent to help another to achieve a goal when the second agent has difficulty doing so.

Initial investigations of infants' understanding of others' helping actions were not designed to address this question and thus provide little evidence regarding infants' expectations about others' helping actions. Typically, infants watched helping and other actions during the habituation phase, not during the post-habituation test phase (e.g., Premack & Premack, 1997; see Hamlin & Tan (2020) for a review). For instance, in a classic study by Premack and Premack (1997), 13-month-old infants watched positive (caressing or helping) and negative (hitting or hindering) interactions during habituation trials but did not show any difference in looking times at the positive and negative actions. Similarly, Hamlin and colleagues presented helping or hindering events to 5- to 10-month-old infants in alternate trials during the habituation phase, but the infants did not show a systematic difference in looking times between helping and hindering events (Hamlin & Wynn, 2011; Hamlin *et al.*, 2007). However, it is hard to take such null results in looking patterns during *habituation* trials as evidence against infants' expectations about others' helping actions due to the nature of the habituation paradigm. During habituation trials, infants' looking times are more likely to be influenced by factors such as their spontaneous preferences, the stimulus complexity, and their familiarity with the stimuli (e.g., Houston-Price & Nakai 2004; Oakes, 2010). Looking preferences can also change over the course of habituation trials (Hunter & Ames, 1988). In addition, infants might not have been given enough time or information to develop expectations about an agent's helping actions during the habituation phase. Thus, such habituation looking times cannot be taken as clear evidence that infants possess no expectations about others' helping actions.

Recently, researchers have begun to purposely examine the nature of infants' expectation of others' helping behaviours and have shown that infants can identify an agent in need of assistance and expect other agents to help the struggling agent, rather than someone else who needs little assistance (Köster, Itakura, Omori, & Kärtner, 2019; Köster, Ohmer, Nguyen, & Kärtner, 2016). In Köster, Ohmer, *et al.* (2016), 9- to 18-month-old infants' eye movements were measured as they observed a series of events in which two characters were acting to accomplish the same goal (obtaining a ball), but only one could achieve the goal while the other could not because of a physical obstacle. The infants more often gazed first at the character in need than at the other as a helper initiated

an action. Additionally, they looked longer at the event outcome in which the helper handed the ball to the character not in need than at the event in which the helper helped the character in need of help. The results suggest that infants expected the helper to help a character in need and were surprised and looked longer when the helper chose the wrong character to help (the character that was not in need).

These seminal works suggest that infants can anticipate and identify the goals of others' helping actions. The findings could be considered evidence of infants' understanding that others would rather not ignore someone in need. However, the infants were shown the same type of action (active helping) towards both characters, and thus, the results do not clearly tell us exactly how infants expect an agent to act towards another in need. Would infants expect an agent to actively help another in need instead of passively standing by? The current study examined this question.

To our knowledge, Jin and Baillargeon (2017) is the only study deliberately designed to examine whether infants expect others to help rather than ignore another in need. During the familiarization events, 17-month-old infants saw an event in which three female actors (A1, A2, and A3) declared their membership using linguistic information. A1 and A3 always declared that they belonged to different groups (outgroup condition) by saying different words (e.g., 'I am a *tig*' vs. 'I am a *bem*'). A2 declared that she belonged to the same group (ingroup condition) as A1 ('I am a *tig*') or A3 ('I am a *bem*'). During the initial phase of test trials, as A2 watched, A1 tried but failed to grasp her out-of-reach goal object and then left the scene. During the final phase of test trials, infants looked longer when A2 picked up A1's goal object and placed it back in the area out of A1's reach (no help event) than when A2 moved A1's goal object within A1's reach (help event) in the ingroup condition, but not in the outgroup condition. The results suggest that the infants expected A2 to help A1 by moving the goal object within A1's reach, but only when the two belonged to the same group. Even when there was no explicit information about their group membership, infants did not expect A2 to help A1.

Do these data then really suggest that infants have no expectations about others' helping actions unless the agent and the recipient clearly belong to the same social group? It is possible that the test event was ambiguous, and the infants might have been uncertain about whether A1's helping action was appropriate, especially when A1 and A2 did not have the same group membership. During the test trial, A1 suddenly left the scene after hearing a bell ring and A2 was left in the scene alone. The infants might have been uncertain about whether it was appropriate for A2 to move the object in A1's possession in A1's absence, especially when A1 and A2 belonged to different groups. In contrast, when the two people belonged to the same group, infants might have inferred that it would be acceptable for A2 to help A1 by moving the other person's object.

If this possibility were not an issue, would infants generally expect someone to be willing to provide help rather than ignore another in need? For instance, consider the following situation. Person A sees person B fall down repeatedly while hiking. As adults, we would expect person A to be likely to offer some help to person B without caring much about their social group membership. If person A simply passed person B by, we might be surprised. Would infants have similar expectations? The current research explored this question by attempting to replicate infants' expectations about others' helping in a different context from previous studies. Replicating former research with a different design has been a critical issue particularly in infant studies, in which subtle changes in a paradigm could strongly impact infant responses to an event (e.g., Baillargeon, Buttelmann, & Southgate, 2018). In addition, the current study went further to examine

a novel aspect of infants' expectation of others' helping: would infants expect others to be helpers, not bystanders?

In the current study applying a violation-of-expectation paradigm, 17-month-old infants were randomly assigned to one of three conditions. In the successful-help condition, the infants first underwent four familiarization trials in which they watched videos about two agents, a square and a circle. In the videos, the square could achieve its goal of climbing a tall hill while the circle could not. During the test phase, the infants witnessed alternating helping and ignoring events. In the helping event, the square helped the circle achieve the goal of climbing the hill by pushing the circle to the top of the hill. In the ignoring event, the square did not help the circle; it simply passed the circle as if completely ignoring the circle's effort to climb the hill. If infants expected the square to help the circle, they would look longer at the ignoring event than at the helping event. If the infants failed to interpret any social interaction during the familiarization phase, the pattern of looking times during the test phase would not differ between the events.

The no-goal condition was designed to exclude the possibility that the infants look longer at the ignoring event than at the helping event merely because the former was perceptually more salient or interesting. In the no-goal condition, the scene during the test trials was identical to those in the successful-help condition, but the circle did not attempt to climb the tall hill during the familiarization trials. Instead, it simply wandered aimlessly. Since the circle did not have the intention to climb the hill, pushing the circle up the hill in the helping event is no longer considered a helping behaviour, although the same scene was shown in the successful-help condition. Infants were expected to spend the same amount of time looking at the helping event and the ignoring event in this condition because the infants could not expect helping behaviour in any of the events. They would look longer at the ignoring event than at the helping event in this condition if the ignoring event were physically more salient than the helping event.

The failed-help condition was designed to exclude the possibility that the infants might look longer at the ignoring event than at the helping event in the successful-help condition because of finding the circle's failure to achieve its goal in the ignoring event more interesting than its goal accomplishment in the helping event. In the failed-helping event, the scene during the familiarization trials was identical to those in the successful-help condition, but the scene of the helping event during the test trial was modified. The square tried to help the circle reach the top of the large hill by pushing it as in the successful-help condition, but they eventually both slipped down to the bottom of the hill. If the infants expected a helping behaviour, they would look longer at the ignoring event than at the helping event as in the successful-help condition. If the infants paid attention only to the goal achievement of the circle, they would look about equally at both events.

Methods

Participants

Forty-eight 17-month-old infants ($M = 16$ months, 17 days; range = 15 months, 11 days to 17 months, 28 days) were tested. The infants were randomly assigned to the successful-help ($N = 16$), no-goal ($N = 16$), or failed-help ($N = 16$) condition. Twenty additional infants were tested but were eliminated because of fussiness ($n = 8$), activeness ($n = 3$), distractedness ($n = 5$), parental interference ($n = 3$), and low reliability between the observers ($n = 1$). The infants were recruited from public health

centres and online communities of child caregivers, and informed written consent was obtained from their parents. Their parents were given a children's book as a reward for their participation.

Stimuli and procedure

During the experiment, each infant sat on his or her parent's lap facing a 22-inch LCD computer monitor (LG L226WTQ). In each case, the infant's head was approximately 45 cm from the monitor. The parents were instructed to close their eyes and remain silent throughout the experiment.

The experiment consisted of four familiarization trials and a pair of test trials.¹ In the videos, two geometric characters (a square and a circle) with two eyes and a nose moved along a small hill and a large hill. The duration of the video in each trial was six seconds, and the videos were played on a loop until each trial ended. A description of the video events that were played on the computer screen is as follows.

Successful-help condition

The infants in the successful-help condition watched the computer-animated videos depicted in Figure 1. During the first and second familiarization trials, the infants watched a yellow square climb two hills successfully and finally arrive at the top of the larger hill (Figure 1a). During the third and fourth familiarization trials, a red circle climbed the small hill successfully but failed to climb the large hill; it moved halfway up the large hill but slid down between the two hills. The square stayed at the top of the large hill during the last two familiarization trials, appearing to watch the red circle attempt but fail to reach the top of the large hill (Figure 1b). The purpose of the four familiarization trials was to inform

(a) Familiarization trials 1 and 2



(b) Familiarization trials 3 and 4 in the successful-helping and failed-helping conditions



(b) Familiarization trials 3 and 4 in the no-goal condition



Figure 1. Selected frames of the familiarization videos.

¹ The video stimuli can be found under this link: <https://www.youtube.com/channel/UCbnDwDsWviUIXie0592OVRA/videos>.

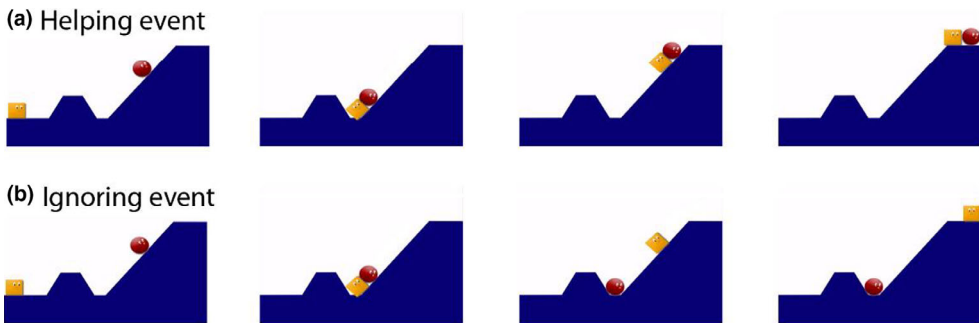


Figure 2. Selected frames of the test videos in the successful-helping and no-goal conditions.

infants that the square could achieve its goal of climbing a tall hill, but that the circle could not.

During the test phase, the infants were exposed to a pair of test trials. At the start of each test event, the yellow square was in the bottom left corner and the red circle was seated between the two hills. This static display was presented on the monitor until the computer signalled that the infant had looked at the display for two cumulative seconds. This pretrial gave the infants the opportunity to notice that the square was in a physical location to help the circle in the test scene. Following the pretrial, the test event began. The circle tried to climb the large hill but slid down to the foot of the hill. In the helping event, the square then moved to the foot of the large hill and pushed the circle up, and both characters reached the top of the large hill together (Figure 2a). In the ignoring event, the square simply passed behind the circle and climbed the hill alone (Figure 2b). Half of the participants watched the helping event first, followed by the ignoring event, the other half in the reverse order.

No-goal condition

The videos shown to the infants in the no-goal condition were identical to those in the successful-help condition except for those shown during the third and fourth familiarization trials (Figure 1b'). During the third and fourth familiarization trials, a red circle climbed the large hill halfway, intentionally changed direction downward and passed the small hill, then turned again and finally stopped at the valley between the two hills. The square stayed at the top of the large hill during the last two familiarization trials, appearing to watch the red circle wander on the hills.

Failed-help condition

The videos in the failed-help condition were identical to those in the successful-help condition except for the helping event shown in the test phase (Figure 3a): the infants watched a failed-helping event instead of a helping event. At the beginning of the trial, the yellow square was in the bottom left corner and the red circle tried to climb the large hill but slid down to the foot of the hill. As in the helping event, the square then moved to the foot of the large hill and pushed the circle up. They approached but did not reach the top of the large hill, and both characters slid down to the foot of the hill.

The infants' looking behaviour was monitored by two observers who viewed each infant through peepholes in cloth-covered frames positioned to the left and right of the

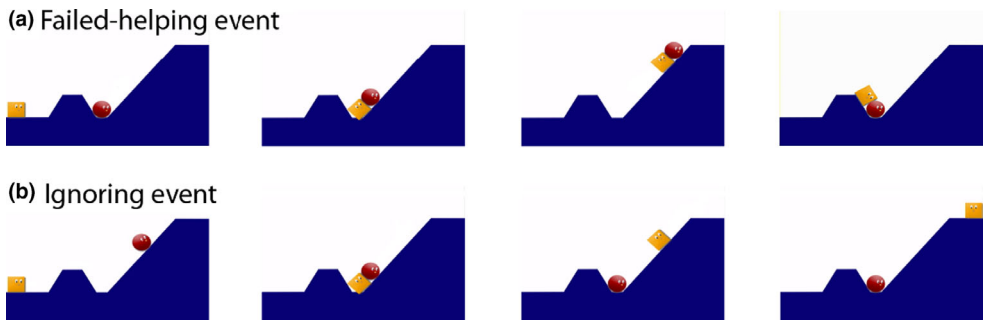


Figure 3. Selected frames of the test videos in the failed-helping condition.

infant. The observers were blind to the condition the infants were assigned to and also to the events the infants watched during the test trials. Each observer held a button pad linked to a computer and pressed the button when the infant was looking at the screen. The looking times recorded by the primary observer were used to determine when a trial had ended. A trial ended if the infant looked away from the monitor for two consecutive seconds after watching for at least six cumulative seconds or if the infant looked at the videos for 60 cumulative seconds. The test trials consisted of a two-second pretrial followed by the main trial. The looking time for the main trial in the test trial was used as the dependent measure.

To calculate inter-observer agreement, each trial was divided into 100-ms intervals, and the computer determined within each interval whether the two observers agreed as to whether the infant was or was not looking at the event. The kappa coefficient for inter-observer reliability was 0.72, indicating substantial agreement (Landis & Koch, 1977).

Results

Preliminary analyses of test data revealed no significant interaction of the condition and test event with infants' gender and/or what type of test event they watched first, $F_s(2,36) < 1.43$, $p_s > .252$. The data were therefore collapsed across gender and order in the subsequent analyses.

The infants' looking times during the four familiarization trials were averaged and analysed with a one-way analysis of variance (ANOVA) with condition (successful-help, no-goal, or failed-help) as a between-participants factor. No main effect of condition was found, $F(2,45) = 2.36$, $p = .106$, suggesting that the mean looking times during the familiarization trials were not influenced by condition.

Figure 4 shows the mean looking times of the infants during the test trials (i.e., helping and ignoring events). The infants' looking times during the main-trial portions of the two test trials were analysed with a 2×3 ANOVA, with the event (helping or ignoring) as a within-participants factor and the condition (successful-help, no-goal, or failed-help) as a between-participants factor. As a significant interaction was found between the event and the condition, $F(2,45) = 3.30$, $p = .029$, partial $\eta^2 = .03$, the following analyses were conducted as a *post-hoc*.

First, the mean looking times were compared between the helping and ignoring events with a separate paired *t*-test for each condition. A significant difference in looking times was found between the helping and ignoring events in the successful-help ($t[15] = 2.98$, $p = .009$, Cohen's $d = .74$) and failed-help ($t[15] = 2.51$, $p = .024$, Cohen's $d = .63$)

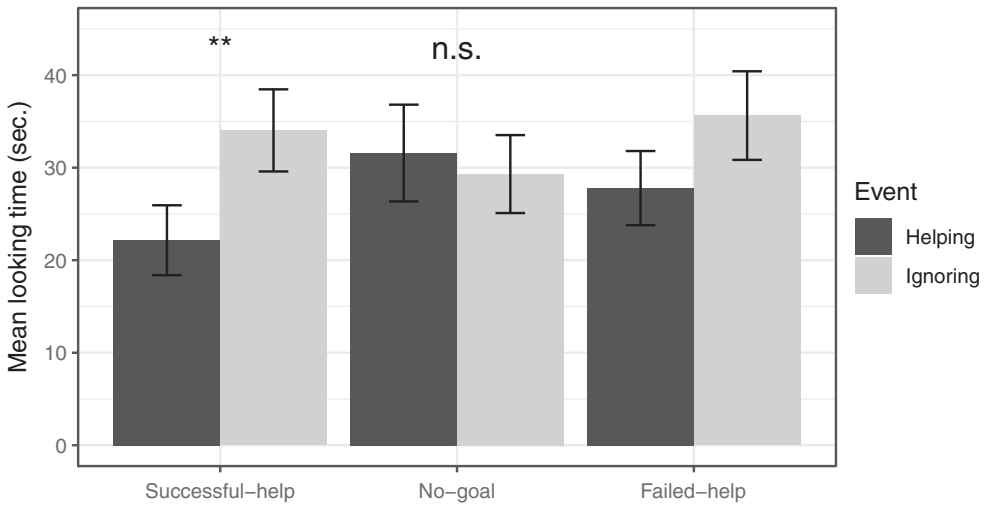


Figure 4. Mean looking times of the infants during the test trials. Error bars represent standard errors. Single and double asterisks indicate statistical differences in looking times at $p < .05$ and $p < .01$.

conditions, but not in the no-goal condition, $t(15) = .48$, $p = .640$. Infants in the successful-help and failed-help conditions looked longer at the ignoring event (successful-help: mean = 34.03s, $SD = 17.75$ s; failed-help: mean = 35.63s, $SD = 19.15$ s) than at the helping event (successful-help: mean = 22.16s, $SD = 15.11$ s; failed-help: mean = 27.79s, $SD = 16.04$ s). However, those in the no-goal condition looked equally at both events (ignoring event: mean = 29.31s, $SD = 16.85$ s; helping event: mean = 31.58s, $SD = 20.92$ s).

Fourteen of the 16 infants in the successful-help condition, six of the 16 infants in the no-goal condition, and 11 of the 16 infants in the failed-help condition looked longer at the ignoring event than at the helping event. Wilcoxon signed-rank tests confirmed that these results were identical to those of the looking-time patterns (successful-help condition: $V = 119$, $p = .006$; no-goal condition: $V = 54$, $p = .755$; failed-help condition: $V = 110$, $p = .029$).

Additionally, we conducted *post-hoc* comparisons of looking times across the three conditions for each of helping and ignoring events. The analyses revealed no difference in looking times for the helping ($F[2,45] = 1.17$, $p = .320$) and the ignoring events ($F[2,45] = .54$, $p = .589$), respectively, across the conditions.

Discussion

Our findings show that infants expect an agent to willingly help rather than ignore others in need. As expected, 17-month-old infants looked reliably longer at the ignoring event than at the helping event in the successful-help condition, suggesting that they expected the square (a competent agent) to help the circle (an incompetent agent) achieve its goal and were surprised when the competent agent did not help the incompetent one.

Two control conditions excluded some plausible alternative explanations for the results of the successful-help condition. First, infants in the no-goal condition looked about equally at the helping and ignoring events. Such results of the no-goal condition allow us to exclude the possibility that the infants in the successful-help condition might

have looked longer at the ignoring event than at the helping event merely because of the perceptual salience of the ignoring event in which the square passed by behind the circle in the 2-dimensional display. Second, the infants in the failed-help condition showed similar looking responses (longer looking times at the ignoring than at the helping event) as the infants in the successful-help condition, suggesting that the 17-month-old infants focused on the agent's intention to help another rather than the achievement of a goal. The current research revealed no evidence regarding infants' attention to event outcome: looking times at the helping events did not differ significantly between the successful-help and failed-help conditions ($t[30] = 1.02, p = .315$), suggesting that infants might not necessarily expect successful outcomes in others' helping actions.

In summary, the current findings suggest that at least by the age of 17 months, infants expect others to behave prosocially towards another in need. Infants not only understand that others' helping actions are directed towards a specific individual in need (Köster, Ohmer *et al.*, 2016), but also expect others to be helpers and not bystanders when someone needs help. The findings resemble toddlers' emotional arousal patterns when they witness an agent in need receiving help (Hepach, Vaish, Grossmann, & Tomasello, 2016). For instance, 2-year-old children showed a greater increase in pupil dilation when they saw a person in need not being helped than when they saw the person being helped by another person. These and the current findings suggest that humans may possess a concern for the welfare of others from very early in development (Hepach, Vaish, & Tomasello, 2012).

In Jin and Baillargeon (2017), infants selectively expected a helping behaviour only when they could identify that the helper and recipient belonged to the same group through linguistic information. In the current research in which no explicit linguistic information was given about the characters' social group, the infants still showed an expectation of helping behaviour between them. It is possible that infants might still have inferred an ingroup relationship between the helper and the recipient because the two characters shared a common goal of reaching the top of the hill. Further research is needed to determine whether this is the case. Subsequent research may examine whether infants will still expect helping behaviour in a situation where the helper and recipient do not share the same goals of their actions. Findings from such future research will tell us more about what information leads infants to assume an ingroup relationship among agents and/or whether infants are prone to exploit group membership when expecting others' helping actions.

How do infants acquire such expectations that others are likely to provide necessary help and not to ignore individuals in need of assistance? The current research does not address this question, but we would like to note that this is an important question for the future that arises from the current research. Just as in the case of the development of prosocial behaviours, we speculate that both social learning and natural bias may contribute to the development of infants' expectation about others' helping actions. The social-interactional perspective on early prosociality (e.g., Rogoff, 2003) holds that infants may acquire prosociality from their specific social experiences. Adults' encouragement/praise or opportunities to participate in helping others can guide the development of infants' helping behaviours (Dahl, 2015; Dahl *et al.*, 2017; Hammond & Carpendale, 2015; Köster, Cavalcante, Carvalho, Resende, & Kärtner, 2016). Indeed, mere observation of others' helping actions can facilitate infants' helping actions: 16-month-old infants who observe an adult model helping another more readily assist a stranger than those who witnessed an adult not helping another (Schuhmacher, Köster, & Kärtner, 2019). Experiences of witnessing others' helping actions may have a similar influence on the

development of infants' helping expectation. For example, watching a caregiver's prosocial actions in an attachment relationship may influence the development of a person's social model from early in development (Johnson, Dweck, & Chen, 2007; Johnson *et al.*, 2010). In a study by Johnson *et al.* (2007), one-year-old infants were familiarized with a scene in which a mother agent left a child agent and the child cried. Next, the infants watched two kinds of test events in which the mother approached the child (responsive event) or moved farther away from the child (unresponsive event). The infants who were securely attached to their caregivers looked longer at the unresponsive event than at the responsive event while the infants with insecure attachment did not show such a looking-time difference.

On the other hand, the natural tendency perspective on early prosociality suggests that social experiences, despite their significant role in prosocial development, are not the only determinant of early prosocial tendencies. Instead, infants may have a natural predisposition to help others or to assume that people are likely to help one another. This possibility is consistent with the nativist perspective of morality as a product of biological adaptation (Baillargeon *et al.*, 2015; Bloom, 2012; Warneken, 2015). Human infants need others' care to survive. Expecting that other individuals will help them may facilitate infants' interactions with others and be advantageous for their survival.

Our study cannot determine which of these perspectives regarding the developmental origin of infants' expectations about others' helping is correct. In the current research, the analysis of the whole group of infants, who may have had varied social experiences, reveals that infants overall expect others' helping actions. Similarly, infants showed that they expect others' comforting actions regardless of their attachment styles (Jin, Houston, Baillargeon, Groh, & Roisman, 2018). Such findings can be viewed as consistent with the natural tendency perspective. However, it is reasonable to assume that both social experiences and natural predispositions contribute to the development of early prosocial development. Specifically, a more critical question for future research would be not whether but how natural tendencies and social experiences influence the development of infants' expectation about others' helping actions (e.g., Dahl & Brownell, 2019; Köster & Kärtner, 2019).

Another remaining question is how infants' expectation about others' helping actions is linked to the development of infants' own helping actions. By 16 to 17 months of age, infants show reliable patterns of helping actions (e.g., Köster, Ohmer, *et al.*, 2016; Warneken & Tomasello, 2007). However, infants' understanding of others' helping actions does not seem to be directly correlated with infants' abilities to produce helping behaviours (e.g., Köster, Cavalcante, *et al.*, 2016; Köster, *et al.*, 2019). Instead, the relationship between infants' prosocial understanding and their own prosocial actions seems to be moderated by basic developmental factors such as their motor and social interaction skills (Köster, Itakura, Omori, & Kärtner, 2019). Future research may further examine the nature of the developmental mechanism whereby basic motor, social, and cognitive competencies lead to the development of infants' own helping actions.

Taken together, our results provide evidence for infants' expectation of prosocial behaviour from others. Our results extend the findings of previous research by showing that such expectation appears when the infants have no knowledge about group membership. Additionally, the prosocial behaviour that they expect is not limited to familiar actions such as comforting behaviours from adults; infants have an expectation of instrumental helping, which may be unfamiliar and difficult for them to produce. Lastly, our results suggest that further studies of the trajectory of the development of this

expectation will be necessary to explore the mechanisms underlying infants' prosocial expectations.

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Conflicts of interest

All authors declare no conflict of interest.

Author contributions

Wooyeol Lee: Conceptualization, Investigation, Writing – original draft; Eun Young Kim: Conceptualization, Investigation, Writing – original draft; Hyun Joo Song: Project administration, Supervision, Writing – review & editing.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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