Helping and hindering guide infants' expectations about future behavior

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Abstract

What inferences do infants make from people's helping behavior? Two preregistered studies examined whether 14- & 15-month-old infants expect consistent helping behavior across different social contexts, and whether any such expectations are consistent with inferences about relationships or dispositions. Participants saw one individual help a target social partner move a boulder up a hill, and they saw another individual hinder the same target from reaching the top of the hill. We then tested infants' expectations about which individual was more likely to provide help in the future by measuring how long they looked when both the helper and hinderer provided help in a new context. In Exp1, the target social partner in the new helping context was the same character that appeared in the familiarization events. In Exp 2, the target was a novel character. Infants looked longer when the hinderer, rather than the helper, provided help to the original target in the new context (Exp1). However, infants' looking times did not differ between events when the target was novel (Exp2). The looking patterns between the two experiments were significantly different. Thus, infants use the pro- or antisocial nature of an individual's past actions to generate expectations for future behavior, but do not generalize those expectations to new targets. Together, this suggests that infants primarily infer social relationships, rather than dispositions, from others' helping behavior.

Keywords: Prosocial; Help; Hinder; Relationships; Infant

Introduction

Every day you witness people helping others. For example, you may see a woman run down the street to alert someone else that they unwittingly dropped their wallet, and then later you may see a different woman helping another person move boxes into their house. As an observer, one possible response is to categorize both women as "helpers" and to have similar expectations for their future helpfulness. But you also may intuitively infer different motivational causes for their actions. You may believe the woman returning the wallet was motivated by her moral "goodness" to help a stranger, while believing the woman moving the boxes was motivated to help a good friend. Inferring different causes for their actions may lead to differing expectations about the two women's future behavior, especially in new contexts or toward new social partners. For instance, the first person's trustworthy behavior toward a stranger might make you feel comfortable asking them to watch your computer while you order a drink in a café. But, unless the second person was a friend, you likely wouldn't ask them to help you move.

While adults may reason about helping differently depending on the context, it is an open question how infants view helping behaviors. Here we ask if infants use observations of helping and hindering to guide expectations about the observed actors' future behavior. In addition, we investigate whether their expectations are more consistent with inferences about dispositional or relational causes. In doing so, we address important open questions about how young humans interpret social interactions.

First, do infants recognize acts of helping and hindering at all? By 14 months of age, infants help others (e.g., opening a door for someone holding magazines; Warneken & Tomasello, 2006, 2007), indicating they recognize some unmet goals and the actions needed to satisfy them. Other studies have found that infants prefer to reach for and look at helpers compared to hinderers or neutral others (Hamlin et al., 2007; Hamlin & Wynn, 2011; Tan & Hamlin, 2022) and that infants expect the target of the helping and hindering actions to approach the helper instead of the hinderer (Hamlin et al., 2007; Kuhlmeier et al., 2003). Extensions of this work suggest that infants' preferences are based on inferences about who intends to be helpful, rather than on surface features of the scenes (Hamlin, Ullman, et al., 2013; Woo et al., 2017; Woo & Spelke, 2022). However, several preregistered studies with large samples have failed to

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replicate the finding that infants prefer helpers (Lucca et al., 2025; Salvadori et al., 2015; Schlingloff et al., 2020). Together, this work provides only mixed evidence that infants understand when others have helped versus hindered.

However, it is possible that infants distinguish helping from hindering, even if they do not have stable, group-level preferences for one type of actor over the other. Indeed, several studies suggest that if given a reason to dislike a target individual, infants prefer another actor who hinders that target over one who helps (Hamlin, Mahajan, et al., 2013). This suggests preferences for helpers may depend on context, in addition to understanding of their actions. Moreover, even when infants do prefer helpers, it may not be because infants have learned something about the helper's behavioral tendencies. Infants could feel positively about the helper's past actions without also expecting that the helper will be "nice" in the future (Jara-Ettinger et al., 2016). To test if infants understand helping or hindering and use those actions to guide expectations about future behavior, here we directly measure such expectations, using a violation of expectation (VOE) design.

If infants use someone's past helping behavior to guide expectations about their future actions, then one critical question becomes: are such expectations based on inferences about what motivates the actions? One possibility is that infants infer helpers possess prosocial dispositions that motivate them to act in morally consistent ways towards most partners (Hamlin, Ullman, et al., 2013; Jara-Ettinger et al., 2016; Woo et al., 2022). In a disposition-based account, the cost an actor is willing to incur to help someone else is used to predict a person's willingness to help others in similar contexts. Similar predictions could arise through simple association between an actor and action type (Benton & Lapan, 2022).

A second possibility is that infants may use observations of helping and hindering to make a more specific inference, restricted to the parties involved. Instead of inferring someone's general willingness to help others, infants may use an actor's past social actions to determine their relationship to the recipient of those actions (Powell, 2022; Thomas, 2025). In a relationship-based account, once infants encode the cost someone is willing to incur to help, or hinder, someone else, they would expect that person to willingly incur a similar cost to affect the same recipient in the future. However, infants would not generate strong expectations about the actor's actions toward other individuals beyond that specific social partner.

Although no published work tests if infants use past helping to guide expectations about future helping, there is broader evidence that infants use actors' past social behavior to guide expectations about future behavior. Some of this evidence is consistent with inferences of relationships, rather than dispositions. Infants expect imitators to be more likely than non-imitators to help and comfort the target of their imitation, but do not hold similar expectations for interactions with novel social targets (Kudrnova et al., 2024;Pepe & Powell, 2025; see also Tatone et al., 2015; 2020 for converging work on giving versus taking). After seeing their parents imitate a puppet, infants also infer that the puppet is likely to know their names; these findings suggest that infants see imitation as a cue of relationships (Thomas, Saxe, et al., 2022). However, not all positive social interactions may elicit the same type of inferences about future behavior and underlying relationships; some behaviors may be selectively associated with communal relationships or with intimacy (Thomas, 2025; Thomas, Woo, et al., 2022). Other evidence indicates older infants and toddlers may use their observations of antisocial actions to infer dispositions: 14- to 27-month-old-infants expect antisocial actors to behave antisocially to both old and new social partners (Gill & Sommerville, 2023; Surian et al., 2018; Ting & Baillargeon, 2021). Nonetheless, it remains unclear how humans learn to recognize and reason about prosocial behavior.

In two preregistered experiments, we tested whether infants use actors' past helping and hindering actions to guide expectations about future helping behavior. We also test whether infants believe helping and hindering actions reflect general prosocial dispositions to help others or relationships between the interaction partners. Both experiments introduced infants to a helper and hinderer of the same target character, followed by alternating test events in which the actors who originally helped or hindered both helped the original target (N=52; Exp1) or a novel social target (N=52; Exp2) in a new context. Infants aged 14 and 15 months are an interesting population to test, because they display expectations about others' behavior (Gill & Sommerville, 2023), but evidence regarding their helper preferences is mixed (see above).

The most basic inference infants could make about future behavior based on observed helping and hindering, consistent with both disposition and relationship motives, is that the previous helpers and hinderers will continue to act the same way toward the same target. Thus, if infants understand and generalize from the initial helping and hindering events, they should look longer when the hinderer, rather than the helper, helps the original target in the test trials of Experiment 1.

Experiment 2 addresses whether any such expectation is based on relationship or disposition inferences. If infants use people's helping behavior to infer prosocial dispositions, then we should also find longer looking when the original hinderer, rather than the original helper, helps the novel target in the test trials. If infants instead use people's helping behavior to infer relationships, then we should not find a difference in infants' looking time to the test trials in Experiment 2, and we should find a significant interaction between trial type and experiment in which infants only look longer when the original hinderer later helps in Experiment 1. If infants either do not understand the helping actions depicted or do not use them to make any inferences about the actors' future behavior, then looking should be similar across test trial types within both experiments.

Experiments 1 & 2

The sample size, experimental displays, and analysis plan were all preregistered prior to data collection, see https://osf.io/zw2sy/.

Methods

Participants The full sample for each experiment consisted of fifty-two 14- and 15-month-old infants (total N = 104; M=14.86 months; SD=.49 months; 49 females). The within-experiment sample size provided 80% power to detect medium-sized effects of expected vs. unexpected trial types on looking of d = 0.40 or higher, while allowing even counterbalancing (this power analysis was carried out with G*Power, Erdfelder et al., 1996). Across the two experiments, eight additional infants were excluded based on preregistered exclusion criteria: older than 15 months and 30 days (1), fussiness (3), and video lag (4). Thirteen pairs of test trials were excluded based on preregistered exclusion criteria: parental or sibling interference (7), looked away without seeing critical action (1), fussiness (4) and video lag (1). Unaffected data from infants who had a test pair excluded were included in analyses.

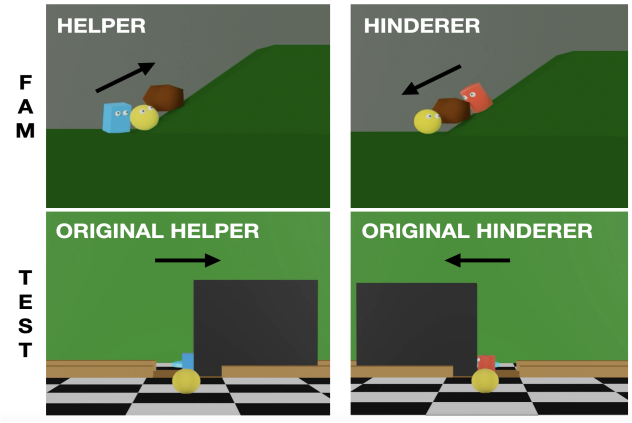

Figure 1: Critical events from experimental displays. The screenshots are zoomed in to show the relevant actions in each scene. Arrows depict direction(s) of movement. During familiarization, one of the characters helped the target up a hill and the other hindered the target by pushing them down the hill. In each test block, both the original helper and hinderer character helped the target in a new context, by pushing a wall out of their path. Depicted test trials are from Experiment 1, in which the original helper and hinderer both helped the original target; in Experiment 2, the original target was replaced by a novel target at test.

Seventy-seven infants were identified by their caregiver as White, 3 as Asian or Asian American, 2 as Black, 12 identified as belonging to two or more races, and 10 chose not to respond. Twenty-four infants were identified by their caregiver as Hispanic/Latinx. Ninety-six infants came from families in which at least one caregiver indicated having a college degree or higher. All infants in this and subsequent studies were full term (gestation ≥ 36 weeks).

Which character appeared first during familiarization (Helper or Hinderer), the identity of the agents who helped and hindered during familiarization (Cylinder or Rectangle), and the order of helping actions at test (Unexpected or Expected first) were all counterbalanced. When the rectangular agent acted as the helper, the hill during familiarization appeared on the right. When the cylinder-shaped agent acted as the helper, the hill during familiarization appeared on the left. The placement of the hill allowed the relative locations of the helper and hinderer (helper more to the left or more to the right) to remain consistent from familiarization to test, across counterbalancing of helper and hinderer identity.

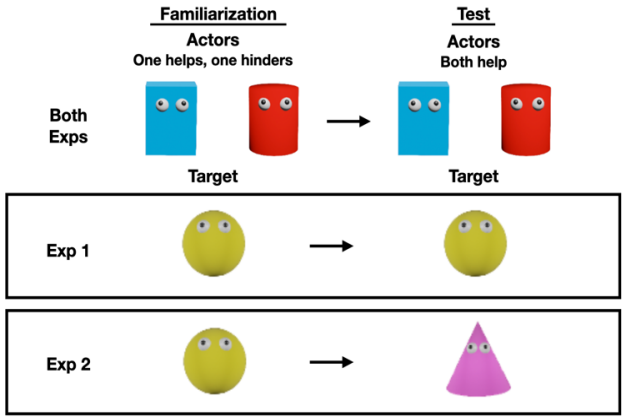

Figure 2: Overview of experiments. In each experiment, infants saw familiarization events in which two characters (the blue rectangle and red cylinder) both interacted with the same target; In Experiment 1, the target during the test trials was the original target who appeared during the familiarization events. In Experiment 2, the target was a novel social agent with whom the original helper and hinderer had not interacted with previously.

Procedure and design Stimuli were created using Blender, a 3D animation program (Blender Development Team, 2021). All events included three 3D-rendered geometric characters with eyes. Participants were tested remotely over Zoom with stimuli videos presented over slides.com. Infants were seated in their parent's lap or in a highchair during the study. If seated in their parent's lap, parents were instructed to close their eyes and keep them closed during the duration of the study. If sat in a highchair, parents sat to the side of the infant and were instructed to avoid redirecting the infant's attention towards or away from the screen. The live and offline experimenters reviewed each session to check for compliance with instructions. The modal screen size across participants was 13 inches (range 10 – 27 inches). An online coder, naïve to trial type, measured infants' looking

throughout the study using Jhab (Casstevens, 2007). During helping & hindering familiarization events and test trials, the experimenter advanced to the next trial once infants looked away from the screen for 2 consecutive seconds or after 60 seconds of elapsed time. Recruitment and study protocol was approved by the university review board at the University of California, San Diego. Caregivers provided informed consent and were compensated with a $5 Amazon gift card.

Stimuli In an initial calibration phase, a multicolored object with sound effects attracted infants' attention to the corners of the screen to help guide coding. Infants then saw helping and hindering familiarization events (three each), one test familiarization event, and four test events. The preregistered stimuli are available to view and download at: https://osf.io/zw2sy.

The helping and hindering familiarization events were identical across Experiments 1 & 2. In each event, a target character (a yellow, spherical character) repeatedly attempted but failed to push a boulder up a hill (see Hamlin et al., 2007; Woo et al., 2024). One of the other two characters intervened, either by helping to push the character and boulder up the hill (familiarization helping event) or by blocking the character's attempts and pushing it back down the hill (familiarization hindering event). Identities of the helper and hinderer were consistent across events but counterbalanced across participants.

The familiarization helping events began when a boulder appeared from off-screen and dropped down into the target character's path up the hill. The target struggled and failed to push the boulder up the hill on their own, and grunted as though expressing disappointment. The helper then pushed the target agent and the boulder to the top of the hill. The helper then returned to their original location. The event then froze until one of the two looking thresholds was met.

The familiarization hindering events began with the hinderer pushing the boulder down into the target's path, making the target unable to independently move up the hill. The target struggled and failed to push the boulder up the hill on their own, and grunted as though expressing disappointment. The hinderer then further blocked the target's efforts by pushing the target and the boulder to the bottom of the hill. The hinderer then returned to their original location. The event then froze until one of the two looking thresholds was met.

Participants then saw the test familiarization event, in which the original target from the previous familiarization phase (Exp1) or a novel target (Exp2) appeared in a new scene. The novel target differed significantly from the original target in both color and shape (i.e. a lavender-colored, cone-shaped character) to ensure infants could differentiate between the two targets. During this event, the target demonstrated a new goal: to jump on a platform located at the end of an alleyway between two brown walls. The target moved toward and jumped onto the platform. Then the target jumped and cheered to celebrate. The agents who had helped and hindered previously were present to observe the target demonstrate its goal. This event repeated three times over 28 seconds, with a .3-second black screen appearing before the event reset each time. An experimenter ensured that the infant saw the target jump onto the platform at least one time, otherwise they repeated the trial. This trial served to make sure that the participating infant understood the target's new goal before needing to interpret helping and hindering actions in the test trials, and it established that the helper and hinderer also witnessed this goal.

Finally came the test events, which depicted either the helper or hinderer helping the target. These events were the same across the two experiments, except for the identity of the target (Exp 1: original target, Exp 2: novel target). In each event a wall blocked the target's access to the colorful platform (see Pepe & Powell, 2025). The target approached the wall and grunted, as though expressing disappointment. In alternating test trials, the original helper or original hinderer dropped down and moved the wall out of the target's path, thus allowing the target access to their goal. Then the wall-mover returned to their starting position. The target then proceeded through the alleyway, jumped onto the platform, and celebrated. The trial then froze until one of the two looking thresholds was met.

Coding & Analyses For all helping and hindering familiarization events and test trials, the experimenter began coding looking times as soon as the helping or hindering action began. The experimenter ended all familiarization events and test trials after the participant had looked away for 2 consecutive seconds or 60 seconds had elapsed since the start of coding. The test familiarization lasted 28 cumulative seconds and ended immediately after the third repetition of the event. The experimenter did not code looking times during the test familiarization event, but repeated the event if participants did not see the agent jump onto the platform at least once.

Test trials were coded frame-by-frame after the experiment, in Datavyu (Datavyu Team, 2014), by an experimenter naive to trial type. To assess coder reliability, 50% of the trials were re-coded by an additional naive experimenter using Datavyu. Intercoder reliability was high, as determined by intraclass coder coefficient (ICC) = .98, $p<.001$, 95% CI [0.98, 0.99]. The raw percent agreement between the two coders was 98.7%. Analyses were conducted on log-transformed looking times to correct for possible skew (Csibra et al., 2016).

Preregistered analyses for this experiment used nested comparisons of mixed effects models to test for the impact of factors of interest on looking time, first for data from both experiments and then each experiment separately. The full models predicted log looking time to each trial as a function of fixed factors of trial type, trial number, help recipient (original or novel target, for the cross-experiment analysis only), and two- and three-way interactions between these factors. Participant ID was included as a random effect and

was specified as intercept only. These full models were compared to reduced models that held out only one factor (e.g. the simple effect of trial type, but not interactions with trial type) at a time.

Results

For data across both experiments, nested comparisons revealed a main effect of trial type on looking time, X^2=5.34, p<.05, d=.23, reflecting longer looking when the original hinderer helped (raw *M*=20.1s, SD=8.85s) than when the original helper helped (raw *M*=18.4s, SD=8.88s). This main effect was qualified by evidence for a significant interaction between trial type and help recipient, X^2=4.77, p<.05, η^2= .11, indicating that the identity of the help recipient (original vs. novel target) affected relative looking to trials in which the original helper or hinderer helped. Analyses of the data within each experiment further explored how infants' expectations differed based on target identity.

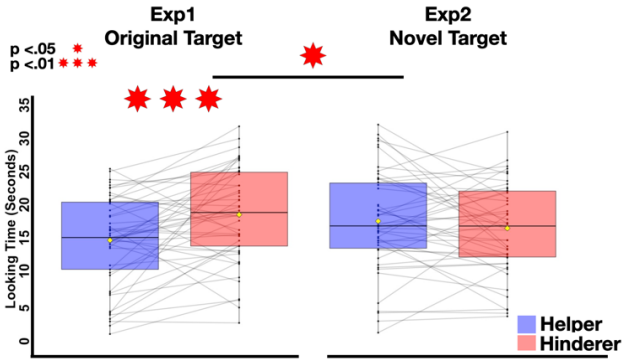

Figure 3: Data from Experiments 1 & 2. Mean looking time in seconds toward each trial type from each experiment (original target or novel target). Black points indicate participant-level data, with gray lines connecting data from the same participant. Yellow diamonds indicate the mean looking time across all participants for that trial type, and box plots present data quartiles; outlying datapoints are beyond +/- 1.5 standard deviations from the upper and lower quartiles.

For data from the test trials in Experiment 1 (original target), a nested comparison of mixed effect models revealed a main effect of trial type on infant looking time in which infants looked significantly longer to the test trials in which the original hinderer helped the target (M=20.9s, SD=8.64s), than to trials in which the original helper helped (M=17.2s, SD=8.87s), X^2=11.95, p<.001, d=.45. This suggests that infants expected the original helper, compared to the original hinderer, to be more likely to help the original target during the test trials.

Data from the test trials in Experiment 2 revealed no main effect of trial type on infant looking time as infants' looking time did not differ significantly between test trials in which the original helper (M=19.6s, SD=8.81s) or the original hinderer (M=19.4, SD=9.08s) helped the novel target, X^2=.01, p=.89, d=.001. Experiment 2 thus did not provide evidence that infants expected the original helper or hinderer to be more likely to help the novel target. Together, data from the two experiments are consistent with our hypotheses that infants use agents' past helpful or hindering actions as evidence of how they will behave in the future, and that their expectations differ based on the identity of the target.

There was a significant main effect of trial number in the analyses that included data from both experiments and from each experiment separately (all p < .01) reflecting a decrease in looking time to later test trials. There were no other significant main effects, 2- or 3-way interactions (p < .1), suggesting that factors unrelated to our hypotheses and counterbalancing order did not reliably influence differential looking towards the two types of test events.

We used paired sample t-tests to compare looking to helping and hindering familiarization events and found no evidence of a reliable difference in looking times: *t*(103) = 0.92, p = .35.

Discussion

Across two experiments, we investigated two main questions. First, do infants expect those who have helped in the past to help again? Second, are infants' expectations based on their inferences about social dispositions or on inferences about relationships? To investigate these questions, we showed infants events in which one character helped and another hindered the same target, and then asked if infants had any expectations about which of the characters would help in a new context. We also asked if infants' expectations depend on whether the helping in the new context was directed to the same target or a novel one.

In support of our hypothesis that infants can use the helping and hindering actions of social agents to predict future behavior, infants in Experiment 1 looked longer to events in which the hinderer, compared to the helper, helped during the test trials. This suggests that when infants observe pro- and antisocial actions, they update their expectations about future behavior.

When infants in Experiment 2 saw the helper and hinderer help a new target in the test events, their looking did not differ. This pattern was significantly different from the one observed in Experiment 1 and constrains interpretations of those results. On their own, the data from Experiment 1 are consistent with the possibility that infants associated the helper with a helpful disposition or role. However, this possibility would also predict a difference in looking when the helper and hinderer helped a novel target in Experiment 2. The overall pattern of data thus supports the hypothesis that infants use the evidence of helping and hindering provided in familiarization to infer relationships. Infants then form selective expectations about interactions between those relationship partners.

The current research focused on infants' generalizations from instrumental helping and hindering in one context to

expectations about instrumental helping and hindering in a similar context. This may suggest that infants' action expectations reflect associative learning about how the helper and target will move together (Benton & Lapan, 2022). One reason to think that this is not the case is that the ways the instrumental helping was carried out in the familiarization and test events were distinct. The familiarization events showed the helping and hindering characters come into direct contact with the target, one (the helper) on a concordant trajectory and the other (the hinderer) on an opposing trajectory. In contrast, test trials depicted the characters helping by moving along a trajectory perpendicular to the target's trajectory, and by contacting the wall rather than the target. The dynamics of the helping action at test were thus no more similar to the familiarization helping action than the familiarization hindering action.

These results also converge with recent work suggesting that infants connect a broader range of social behaviors by inferring relationships. For example, after observing social imitation, infants expect the interaction partners to engage in helping, to respond to distress, and to share social knowledge (Kudrnova et al., 2024; Pepe & Powell, 2025; Thomas, Saxe, et al., 2022). Intimate interactions (e.g., two people putting the same orange slice in both of their mouths) also lead to expectations of social support that are specific to the original interaction partners (Thomas, Woo, et al., 2022). Following proximity- and synchrony-based evidence of a social relationship, infants also expect one relationship partner to display positive empathic emotions following the other's success (Smith-Flores et al., 2024). Together, these findings support the idea that infants possess an abstract concept of social affiliation that allows them to organize observations and expectations about a range of prosocial behaviors between relationship partners (Powell, 2022; Thomas, 2025). Future research should investigate two related topics: first, do infants distinguish between prosocial behavior types when making inferences about relationship type or strength? Second, under what circumstances might infants make inferences about disposition-based motives, rather than relationships?

As infants learn about their social environment, they may go beyond merely identifying relationships and also differentiate them by type (Thomas, 2025) and strength (Powell, 2022) of peoples' social relationships, which they use to guide their predictions for how people are likely to interact. In support of this hypothesis, recent work has found that infants and children use certain positive social interactions (e.g. saliva sharing) to infer stronger, "thick" social relationships between social partners, compared to those who engage in other positive social interactions (e.g. cooperative play; Thomas, Woo, et al., 2022). Helping may also provide evidence of a "thick" social relationship, given that one agent expends effort to foster another's goal. Alternatively, if infants perceive helping as a less intimate behavior, it may lead to weaker relationship inferences. Infants' relationship inferences may also depend on the social context in which helping occurs, as the need of the recipient and the cost to the helper to act may contribute to how strongly two individuals appear to be affiliated (Woo et al., 2024). Future research should test the extent to which infants use patterns of helping to guide their estimates of relationship strength and predictions for future behavior.

Another question is whether there are circumstances in which infants use instrumental helping and hindering to infer dispositions. Adults and older children use the consistency of social behaviors, across time, setting, and social patterns, to make disposition-based inferences about how people will act towards new social partners in the future (Boseovski & Lee, 2006; Kelley, 1967, 1973; Słysz, 2021). Here we only provided infants with evidence of helping or hindering toward one partner in one context before testing their expectations, so their inference of a relationship rather than a disposition may reflect a rational interpretation of the evidence rather than a limit on the social inferences they can make (Fawcett & Markson, 2010; Gelpi et al., Forthcoming; Kushnir et al., 2010; Lucas et al., 2014; Seiver et al., 2013). Future research should test whether infants use broader patterns of evidence to infer prosocial dispositions that generalize to interactions with new partners, or if their expectations continue to imply inferences about specific relationships.

Our results are inconsistent with work that has found that infants use behavioral evidence to infer dispositions. In this work, infants expect social agents who hinder or act unfairly to also behave antisocially towards novel targets (e.g. expecting a social agent who acts unfairly towards one social partner to later hinder a novel social partner). In contrast, infants did not expect helpers or fair actors to be more prosocial toward novel targets (Gill & Sommerville, 2023; Surian et al., 2018). Infants may make different inferences based on observations of prosocial and antisocial behavior, perhaps due to a negativity bias in which antisocial behavior is more influential when deciding how someone will act towards future social partners (Gill & Sommerville, 2023; Hamlin & Baron, 2014). Future research should further examine the differences between infants' inferences for antisocial vs prosocial actors, and the extent to which they use each type of behavior to infer dispositions vs relationships.

In sum, the experiments presented here provide insights into infants' understanding of helping and hindering actions. Here, infants expected social agents who helped, compared to those that hindered, to help the original target in new social contexts. It appears that infants used their observations to infer specific relationships, as they did not expect the original helper or hinderer to be more likely to help a novel social agent.

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