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Stopping at nothing: Two-year-olds differentiate between interrupted and abandoned goals

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ABSTRACT

Previous research has established that goal tracking emerges early in the first year of life and rapidly becomes increasingly sophisticated. However, it has not yet been shown whether young children continue to update their representations of others' goals over time. The current study investigated this by probing young children's (24- to 30-month-olds; N = 24) ability to differentiate between goal-directed actions that have been halted because the goal was interrupted and those that have been halted because the goal was abandoned. To test whether children are sensitive to this distinction, we manipulated the experimenter's reason for not completing a goal-directed action; his initial goal was either interrupted by an obstacle or abandoned in favor of an alternative. We measured whether children's helping behavior was sensitive to the experimenter's reason for not completing his goal-directed action by recording whether children completed the experimenter's initial goal or the alternative goal. The results showed that children helped to complete the experimenter's initial goal significantly more often after this goal had been interrupted than after it had been abandoned. These results support the hypothesis that children continue to update their representations of others' goals over time by 2 years of age and specifically that they differentiate between abandoned and interrupted goals.

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Introduction

From navigating a busy street to organizing a business meeting, there are many everyday contexts in which it is important to be able to attribute goals to other agents in order to predict their actions and to coordinate our actions and plans with them. This ability emerges early in the first year of life and rapidly becomes increasingly sophisticated. By 3 months of age, infants expect agents to pursue goals that are consistent with their prior goal-directed behavior (Kim & Song, 2015; Luo, 2011; Sommerville, Woodward, & Needham, 2005). By 12 months of age, infants are sensitive to information about other agents' internal states, such as preferences (Luo & Baillargeon, 2005; Spaepen & Spelke, 2007) and beliefs (Southgate, Senju, & Csibra, 2007; Southgate & Vernetti, 2014), as well as external environmental constraints (Csibra, 2008; Liu & Spelke, 2017) in attributing goals. From early in the second year of life, children also take verbal communication (Jin & Song, 2017) and nonverbal communication (Tauzin & Gergely, 2018) into account when attributing goals.

Accurate goal tracking requires continuously updating representations of others' goals over time, in particular because agents sometimes change their goals. For example, suppose that an agent has the goal of placing a book in a cabinet. She picks up the book, walks over to the cabinet, and begins to open the cabinet door—but then halts her action. To discern whether she still has the goal of putting the book in the cabinet, it is crucial to identify why she has halted her action. Environmental circumstances may have *interrupted* her goal by presenting her with an obstacle (e.g., she may have noticed that she cannot open the cabinet door without a key and therefore must set the book down while going and getting the key). Alternatively, she may have changed her mind, *abandoning* the goal of placing the book in the cabinet (e.g., she may have been attracted by the cover of the book and decided that she would like to open it and read it). Only in the latter case should the goal that we attributed to this agent (i.e., putting the book in the cabinet) be updated; in the former case, she has merely halted the action momentarily because of an obstacle.

Most of the research on goal attribution during early childhood implements experimental scenarios in which the target agent's goal remains constant. Therefore, little is known about whether young children continue to update their goal attributions over time. This is a significant gap; the ability to update our goal representations is crucial for many aspects of social cognition, supporting action prediction, coordination in joint action, and flexible prosocial behavior, in particular instrumental helping. Reconsider the above example; if the agent's goal of placing the book in the cabinet was interrupted by an obstacle (the lock), she would be grateful if a friend were to help by retrieving the key for her. Alternatively, if she has abandoned the goal, it would not be helpful at all if her friend blindly persisted in helping her. Depending on why the initial goal-directed action was halted, then, it may or may not be appropriate to persist in contributing to that goal. Therefore, it is important that children track others' goals over time and update their representations of others' goals, in particular distinguishing between interrupted goals and abandoned goals. Research investigating whether young children are fluent in making this distinction therefore would deepen our theoretical understanding of the development of goal attribution and flexible prosocial behavior.

Although we are not aware of any research directly addressing this issue, some previous research provides reason to believe that proficiency in making the distinction between goal abandonment and goal interruption may emerge at a very early age. One groundbreaking study by Behne, Carpenter, Call, and Tomasello (2005) demonstrated that 9-month-olds distinguish between a scenario in which an experimenter is unable to pass an object to the child (e.g., because the experimenter has dropped the object or cannot open the lid of a transparent container) and a scenario in which the experimenter is unwilling to pass the object. Crucially, the experimenter first establishes a routine of passing objects to the child, so when she stops this routine on test trials (because she is either unable or unwilling to continue), she can be characterized either as having been interrupted or as having abandoned the routine of passing objects—although the experimenter never interrupts or abandons specific goal-directed actions once she has begun it (i.e., within a trial). Although there has not been any other research directly bearing on children's understanding of goal abandonment, there is substantial research establishing that young children understand goal interruption. Most notably, by 18 months of age, children

instrumentally help an agent who encounters an obstacle while pursuing a goal (Drummond, Paul, Waugh, Hammond, & Brownell, 2014; Hepach, Vaish, Grossmann, & Tomasello, 2016; Hepach, Vaish, & Tomasello, 2012; Liszkowski, Carpenter, Striano, & Tomasello, 2006; Liszkowski, Carpenter, & Tomasello, 2008; Svetlova, Nichols, & Brownell, 2010; Warneken & Tomasello, 2006). Moreover, Warneken, Gräfenhain, and Tomasello (2012) showed that 21- and 27-month-olds respond differently to an experimenter who is unwilling to continue playing than to one who is willing but who has merely been interrupted (by dropping a toy). Finally, one study by Martin and Olson (2013) showed that 3-year-olds help in a manner that is sensitive not just to an adult's immediate request but also to their more distal goal (i.e., they decline to pass an adult a requested object if that object is not actually helpful in light of the adult's distal goal).

Taken together, these findings indicate that children understand when an agent maintains a goal despite the presence of an external obstacle that prevents the immediate completion of the goal and that they can use this information to guide their helping behavior. None of these findings, however, directly address the question of whether young children understand when an agent has taken up a goal and then subsequently abandoned it for a different goal. The current study addressed this question.

Because there is evidence that children understand goal interruption and are motivated to instrumentally help when an agent's goal is interrupted, an instrumental helping paradigm presents an ideal context in which to probe young children's ability to distinguish between interrupted and abandoned goals. In addition, the use of an instrumental helping paradigm enables us to contribute to the literature on prosocial behavior during early childhood.

If children can differentiate between goal interruption and goal abandonment and can use this information to guide their actions in instrumental helping tasks, then we should expect them to exhibit this ability by 2 years of age. At ages younger than 2 years, we would not expect this; there is evidence suggesting that children younger than 2 years struggle to appropriately help when there are multiple helping affordances or when cues for an agent's goal are ambiguous or absent at the moment when help is solicited (e.g., Hepach et al., 2016; Hobbs & Spelke, 2015; see also Krogh-Jespersen, Liberman, & Woodward, 2015; Waugh & Brownell, 2017).

To test this hypothesis, we developed an instrumental helping paradigm in which we manipulated why the experimenter (E) did not complete a goal-directed action. On test trials, E began to place a toy in one of two boxes (initial location) but did not complete this action. In the abandoned goal condition, E indicated that he had changed his mind and would prefer to place the toy in the other box (alternative location). In the interrupted goal condition, E encountered a physical obstacle that prevented him from reaching the initial box. Despite this, he continued to maintain the initial goal (i.e., to see the toy placed in the initial location).

Because we were interested in the cognitive underpinnings of helping behavior and not the motivation, we sought to maximize the number of trials on which children would try to help. Accordingly, E asked children to help without specifying which box was his current goal. We measured where children helped to place the toy, that is, whether they helped to place the toy in the box that was E's initial goal (initial location) or whether they helped to place the toy in the other box (alternative location). To appropriately help E, children needed to continue to update their representation of E's goals and to distinguish between abandoned and interrupted goals (i.e., it was not sufficient to notice that E had halted his initial goal-directed action). If children differentiate between these causes of E not completing his initial action, we should expect their helping behavior to differ between the two experimental conditions. Therefore, we predicted that children would help to place the toy in the initial location more often in the interrupted goal condition than in the abandoned goal condition.

The hypotheses, sample size, methods, exclusion criteria, analyses, and pilot data were preregistered before data collection and can be accessed at https://osf.io/4k2h9/?view_only=1a1ba0a24a8c4f1fb3ffc98a553d25d1. All aspects of the study were carried out in accordance with the preregistered protocol unless otherwise stated.

Method

Participants

Using the R package "SIMR" (Green & MacLeod, 2016), it was determined that a sample size of 20 would provide power of at least 90% for detecting a medium-sized effect, as observed in a pilot study (see online supplementary material SM1) for our primary analysis. After beginning data collection but prior to commencing data coding, we modified the design to counterbalance the last location referred to by E on test trials; this change necessitated an adjustment of the target sample size to 24 because we were then counterbalancing three factors (see "Design" section below). Thus, 24 participants were included in the final sample (8 girls; average age = 26;28 [months;days], range = 25;02–30;00). In addition, 19 participants were tested but excluded from final analysis according to preregistered drop-out criteria (see the "Coding and dropout criteria" section below). Specifically, 7 participants who helped to place toys in the same box on each test trial were excluded, and 12 participants were excluded because they did not complete at least two trials in each condition due to fussiness ($n = 7$), shyness ($n = 1$), or taking too long to help E on too many test trials ($n = 4$). All participants were recruited from a database of families in the Department of Psychology at the University of Warwick and from nurseries in the surrounding area. Most participants came from middle-class backgrounds and were Caucasian.

Materials/Apparatus

Participants sat 1.65 m away from the apparatus (see Fig. 1) on their caregivers' lap. The apparatus consisted of two colored boxes, yellow and green (each 35 × 20 × 65 cm and each with a white barrier on the inside), with colored tubes that ran into these boxes (70 cm long and 8 cm in diameter). Placing the toy in either box required that the toy be dropped into the appropriate tube. The boxes were separated by a white barrier (35 × 95 cm). A small transparent box sat between this barrier and participants, which was where E placed the toy after asking for participants' help. The toys were small cubes (5 × 5 × 5 cm), each of which was equally colored green and yellow.

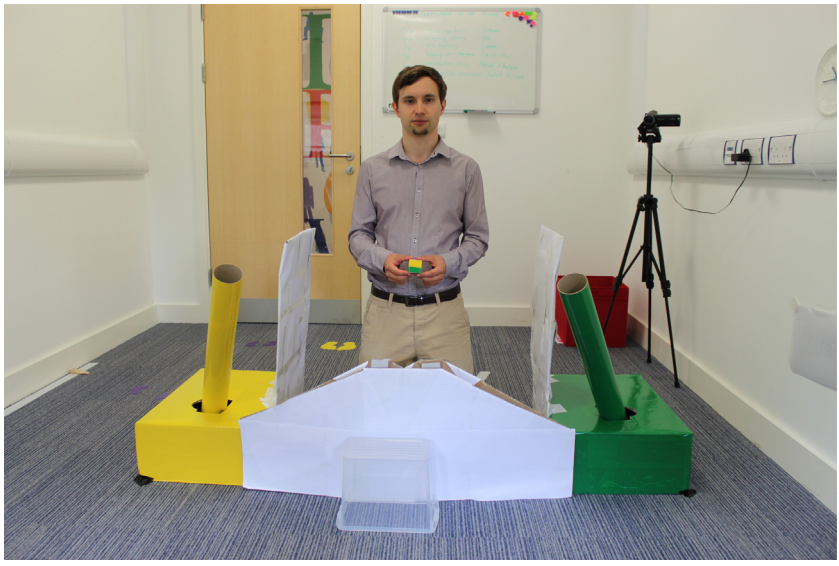

Fig. 1. Apparatus from the perspective of participants. The box and tube on the left are yellow, and those on the right are green.

A plank ran along the ground between the two boxes, although participants were unable to see this because of the white barrier. The bottom of the tubes rested on this plank, and moving this plank rotated the tubes. This rotation (along with the barriers on the insides of the boxes) prevented E from reaching one of the tubes (see Fig. 2).

Design

We implemented a within-participants design, with participants performing eight test trials in total. To control for order effects of condition, the eight trials were split into two blocks of four trials: Block 1 (interrupted goal, abandoned goal, interrupted goal, abandoned goal) and Block 2 (abandoned goal, interrupted goal, abandoned goal, interrupted goal). The order of blocks, E's initial goal location, and whether the final location referred to by E was E's goal by the end of each trial were counterbalanced.

Procedure

Participants were tested individually in laboratories at the university or at nurseries. Caregivers gave informed written consent, and participants received a gift for taking part. Sessions lasted approximately 20-min. The experiment was conducted in accordance with the Declaration of Helsinki and was approved by the humanities and social sciences research ethics subcommittee at the University of Warwick as part of the European Research Council (ERC)-funded project "Sense of Commitment: 679092."

The apparatus and procedure were validated in a separate study with adults (see supplementary material SM2). Caregivers were present and played a largely passive role in test trials with two exceptions: They were instructed to draw participants' attention to E ("Look at what E is doing") if participants were not watching E and to encourage shy participants to help without giving specific instructions as to which box to help place the toy in ("Can you help [E]? Can you put it where [E] wants it?").

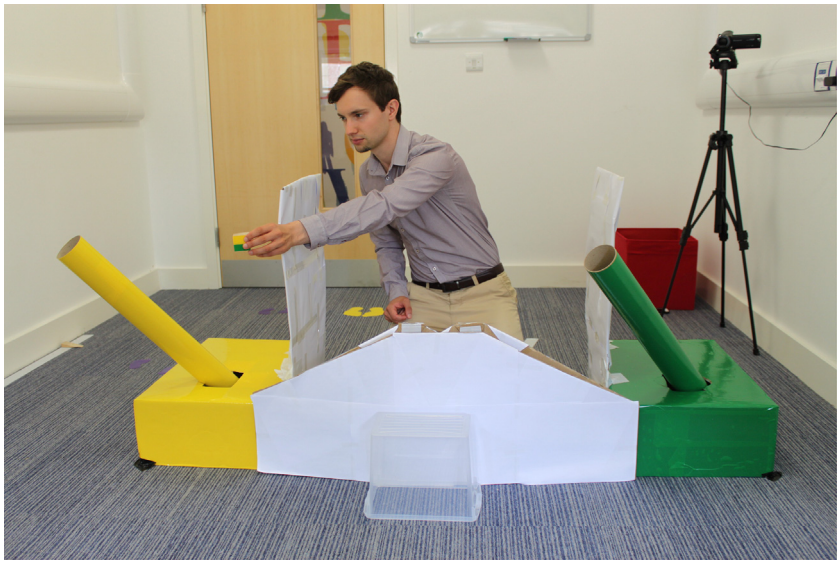

Fig. 2. Apparatus from the perspective of participants once the tubes have rotated. Tubes can be surreptitiously moved by the experimenter. The box and tube on the left are yellow, and those on the right are green.

During warm-up, participants were acquainted with the boxes and toys as well as with helping to place the toys in the boxes via the tubes. After warm-up, caregivers were asked to sit on a chair with participants on their lap while E sat between the two boxes (behind the barrier).

Familiarization phase

There were six familiarization trials in which participants were acquainted with helping E, the obstacle that E encountered in the interrupted goal condition (i.e., the rotation of the tubes), and the fact that E sometimes abandoned his initial goal. In two of these trials, E began to place a toy in one of the boxes but then decided instead to place the toy in the alternative box. In the next two trials, E began to place the toy in one of the boxes before encountering an obstacle (i.e., the tubes rotated such that he could no longer reach his desired tube). In the two remaining familiarization trials, the rotation of the tubes moved E's desired tube closer to him. In all trials, E then asked participants for help in placing the toy in E's desired box and placed the toy on the transparent box in front of the white barrier separating participants from E. Participants were given no specific feedback about where they placed the toy; regardless of where they placed the toy, E thanked them and clapped and asked them to sit with their caregivers again.

Test phase

There were eight test trials in total (four per condition). The number of times that E referred to each box and the time E spent looking at each box were kept constant in each test trial, although the type of reference, gesture, and facial expression made toward each box differed depending on whether this was E's current goal. Each test trial consisted of three phases: (a) establishing E's initial goal, (b) establishing that E was not going to complete the initial goal-directed action, and (c) participants helping E.

At the beginning of each trial in both conditions, E used gesture and verbal reference to indicate his initial goal: "Where will I put it [the toy]? In the green box [or yellow; this was counterbalanced]? No [E shook his head and frowned toward the green box], I want this in the yellow box [E nodded and smiled toward the yellow box]." Once E's initial goal (in this example, the yellow box) was established, he began the action of placing the toy in the tube connected to the yellow box.

In the interrupted goal condition, E's goal-directed action was not completed because the tubes rotated (E rotated them surreptitiously), such that E was unable to reach the tube connected to the yellow box. E unsuccessfully reached toward the yellow tube for several seconds, bumping into the barrier on the inside of the yellow box (see Fig. 2). E then explained, "I want it [the toy] in the yellow box [E nodded and smiled at the yellow box], but I cannot reach now! I can only reach the green box, but I do not want it there [E touched the green box with the toy and shook his head and frowned]."

In the abandoned goal condition, E did not complete the initial action because he changed his mind: "Actually, I do not want this in the yellow box anymore [E frowned and shook his head at the yellow box]. Ah, now I want this in the green box [E touched the green box with the toy and nodded and smiled]." In this condition, the tubes did not rotate.

Both conditions ended with E saying, "You can walk anywhere. Can you help me put it where I want it?" E placed the toy on the transparent box that was in front of the white barrier separating participants and E, at which point caregivers were instructed to set participants down directly in front of them.

If participants did not initiate the helping behavior, E repeated this request. E then signaled to caregivers to encourage participants to come forward. Throughout this period, E maintained eye contact with participants and smiled encouragingly. Participants were given no specific feedback about where they placed the toy; E thanked them (regardless of which box participants helped to place the toy in) and encouraged them to return to their caregivers' lap. Once participants had done so and settled down, the next trial commenced.

Coding and dropout criteria

For each trial, we coded where participants helped to place the toy (initial location vs alternative location). We then coded how participants helped E, distinguishing between two types of helping behavior: placing the toy in one of the boxes and moving one of the tubes closer to E. Because the

latter occurred only seven times in total, and because we considered the two helping types to be equivalent, we collapsed these two helping types in the analyses. We also coded response type (i.e., whether participants' helping behavior was correct or incorrect); the correct helping location in the interrupted goal condition was the initial location, whereas the correct helping behavior in the abandoned goal condition was the alternative location.

All sessions were recorded using digital video recorders. Coding was carried out by a naïve research assistant. The coder assessed helping location (initial location vs alternative location), response type (whether participants' helping behavior was correct or incorrect), and trial exclusion (whether individual trials should be dropped from analysis for any of the reasons listed below). A second naïve research assistant coded a random 6 participants (25%) for reliability (helping location: Cohen's κ = .90 [95% confidence interval (CI) = .81, 1.00], p < .001; helping type: Cohen's κ = .66 [95% CI = .40, .92], p = .001; response type: Cohen's κ = .87 [95% CI = .78, 1.00], p < .001; trial exclusion: Cohen's κ = .58 [95% CI = .32, .86], p = .001).

Participant dropout criteria

Pilot testing revealed that some children had a strong preference for one of the colors, and always placed the toys in the box with that color. For this reason, we decided to exclude participants who helped to place the toy in only one of the two boxes on all test trials (indicating that they had a preference for a particular box that overrode any motivation to help E). We also excluded participants who did not complete at least two of four trials in each condition.

Trial exclusion criteria

A trial was excluded if any of the following criteria were met: (a) if caregivers instructed participants as to which box to help place the toy in, (b) if there was a delay longer than 15 s between E finishing his script (or participants being let go by their caregivers, whichever happened last) and participants helping to place the toy in either of the boxes, or (c) if participants were not watching when E halted his goal-directed action or during the experimental manipulation (i.e., the dialogue specified in criterion b). If this occurred, E called participants by their name and tried again. If participants still did not pay attention, the trial was excluded and E moved on to the next trial.

Results

Data screening

Of the 24 participants included in our analysis, 16 test trials were excluded (7 in the abandoned goal condition and 9 in the interrupted goal condition) due to a delay of longer than 15 s between E's initial request for help and participants' helping. This left 176 test trials for further analysis (89 in the abandoned goal condition and 87 in the interrupted goal condition). In 169 of these test trials participants helped E by placing the toy in one of the boxes (87 in the abandoned goal condition and 82 in the interrupted goal condition), and in the remaining 7 trials participants helped by moving one of the tubes closer to E (2 in the abandoned goal condition and 5 in the interrupted goal condition). We collapsed these helping types for further analysis.

Initial versus alternative goal location

To investigate whether participants differentiated between abandoned and interrupted goals, we used helping location—whether children helped to place the toy in the location where E was initially trying to place it or in the alternative location. Children helped to place the toy in the initial location on 35% of trials in the abandoned goal condition and in 64% of trials in the interrupted goal condition (see Fig. 3).

To test whether the cause of E not completing his initial goal-directed action had an effect on helping behavior, we used the *wilcox.test* and *wilcoxonPairedR* functions of the R package "rcompanion" (Mangiafico, 2016) to run a paired Wilcoxon signed-rank test. We used the Wilcoxon test for

comparing proportions across conditions throughout the article because proportions do not meet the assumptions of *t* tests. (As we had proposed in the preregistration, we also ran generalized linear mixed-effect modeling for the data throughout the study. See supplementary material for the results, which are the same as those for the Wilcoxon test. We report the results of the Wilcoxon test here because it is more familiar to readers and because it is simpler to report.) For each participant, we calculated the rate of helping E by placing the toy in the initial location per condition. The median rate of helping to place the toy in E's initial goal location was 33% in the abandoned goal condition and 75% in the interrupted goal condition. The median proportion of participants who placed the toy in E's initial goal location was significantly higher in the interrupted goal condition than in the abandoned goal condition ($V = 160$, $p = .009$, $r = .54$).

This indicates that participants differentiated between goal abandonment and goal interruption in their helping behavior. However, the results of the foregoing analysis do not rule out the possibility that the effect found here may have been driven by participants being more accurate in their helping in one condition than in the other condition. Indeed, it appears from Fig. 3 that children were particularly likely to place the toy at the initial location in the interrupted condition, raising the possibility that the difference between conditions may have been driven by some children perseverating on the initial location. If this was the case, we should expect children to have been more accurate in the interrupted condition than in the abandoned condition. Therefore, we also tested whether participants were more likely to help E correctly in one condition than in the other condition.

Correct versus incorrect helping behavior

Children correctly helped E in 65% of trials in the abandoned goal condition and in 63% of trials in the interrupted goal condition. To test whether the results of the main analysis were driven by participants helping correctly significantly more in one condition than in the other condition, we used the

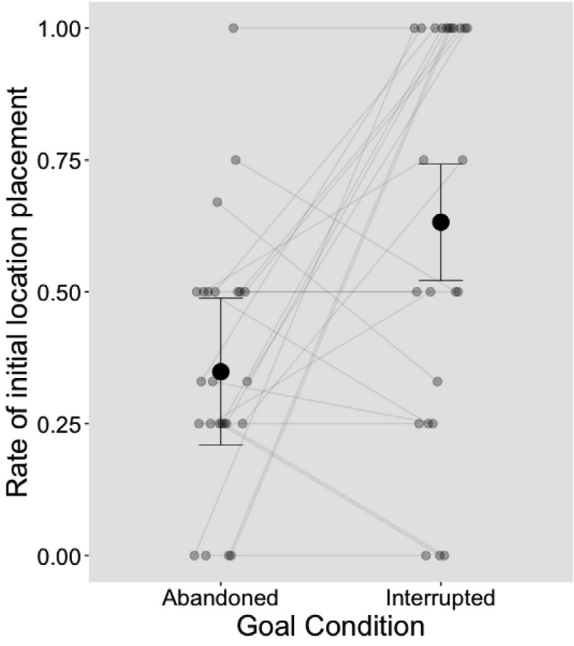

Fig. 3. Proportions of trials on which participants helped the experimenter to place the toy in the initial location with 95% confidence intervals of the means adjusted for within-participants design (Cousineau, 2005; Loftus & Masson, 1994; Morey, 2008). Jittered dots represent individual participants' performances in a given condition, with light gray lines connecting each participant's performance across conditions.

wilcox.test and *wilcoxonPairedR* functions of the R package "rcompanion" (Mangiafico, 2016) to run a paired Wilcoxon signed-rank test. The median rate of correct helping was 67% in the abandoned goal condition and 75% in the interrupted goal condition. The results indicated that participants were not significantly more likely to help E correctly in one condition than in the other condition (V = 74.5, p = .943, r = −.02).

Finally, to determine whether participants helped correctly above chance (50%) in each condition, we compared the proportion of trials with correct helping against 50% with two one-sample Wilcoxon signed-rank tests using the *wilcox.test* and *wilcoxonOneSampleR* functions of the R package "rcompanion" (Mangiafico, 2016). Correct helping differed significantly from chance in both the abandoned goal condition (V = 127, p = .008, r = .53) and the interrupted goal condition (V = 157, p = .023, r = .38).

Discussion

We tested whether 2-year-old children differentiated between interrupted and abandoned goals in an instrumental helping task. The results revealed that children's helping behavior differed significantly between the abandoned goal condition and the interrupted goal condition, although it is worth noting that the difference may have been driven by a minority of the participants responding very strongly to the manipulation (see Fig. 3). The results also reveal that participants correctly helped E above chance in both conditions, although they did not find either condition easier than the other condition. This rules out the possibility that the difference between conditions may have been driven by some children perseverating on the initial location; if this were the case, we should expect children to have been more accurate in the interrupted condition than in the abandoned condition. Taken together, these results support the hypotheses that 2-year-olds continue to update their representations of others' goals over time and that they understand both goal abandonment and goal interruption.

Importantly, these results cannot be explained by learning effects from the first condition that children encountered on test trials (Brooks, 2012) given that we implemented a block design for the eight test trials, counterbalancing the order of blocks between participants. Similarly, because we counterbalanced which box E referred to last, we can rule out the possibility that children were simply placing the toy in the box that E referred to last before asking for help. Moreover, the difference in children's behavior between the two conditions cannot have been due to children's color preferences either (Marshall, Stuart, & Bell, 2006) given that those children who helped to place all the toys in only one of the boxes were excluded prior to analysis.

The current study contributes to two distinct bodies of previous research. First, the study builds on research investigating goal tracking during early childhood. This research typically implements scenarios in which the target agent's goals remain constant over individual test trials (Cannon & Woodward, 2012; Csibra, 2008; Liu & Spelke, 2017; Southgate & Vernetti, 2014; Woodward, 1998). Our findings extend that research by changing the target agent's goals not only between test trials but also sometimes *within* test trials.

Furthermore, our findings contribute to research on early prosocial behavior. Most previous research probing the emergence of instrumental helping behavior presents children with only one goal affordance during test trials, and children are typically faced with a helpee whose goals do not change during test trials (e.g., Barragan & Dweck, 2014; Cirelli, Wan, & Trainor, 2016; Dahl et al., 2017; Dunfield & Kuhlmeier, 2010; Hepach, Haberl, Lambert, & Tomasello, 2017; Kenward & Gredebäck, 2013; Over & Carpenter, 2009; Warneken & Tomasello, 2006)—although, as noted earlier, Martin and Olson (2013) showed that 3-year-olds help in a manner that is sensitive to the distinction between an adult's proximal and distal goals. Our findings extend this research by revealing that 2-year-olds are able to help appropriately in dynamic social settings in which an agent's goals sometimes change. Moreover, the current study provides new impulses for research investigating the cognitive and motivational underpinnings of prosocial behavior during early childhood. For example, our findings are relevant for research exploring the hypothesis that the identification of an agent's goal leads young children to take up that goal as their own and, accordingly, to be motivated to complete unfinished actions (Michael & Székely, 2019; Paulus, 2014). This is because, as Michael and

Székely (2019) stated, this hypothesis leads to the prediction "that an infant would continue helping ... if an agent were to become distracted, lose interest or otherwise abandon the goal" (p. 181). By establishing that 2-year-olds understand goal abandonment, the current study provides a basis for testing this prediction. (It must be noted, however, that the current study was not designed to test this prediction: in the current study, E took up a new goal after abandoning the original one, so children's failure to complete the original goal-directed action may be due to their having taken up the new goal.) Research along these lines would clarify whether "helping" behavior during early childhood can be interpreted as a behavior driven by children's altruistic motivation (Warneken & Tomasello, 2006) or as a behavior motivated by a goal that has now become children's own goal.

Our findings also raise new questions about *how* children track the goals of others. As in most previous research on goal tracking, this study used multiple cues to indicate E's goals: gestural cues (Sodian & Thoermer, 2004), verbal cues (Jin & Song, 2017), goal-directed actions (Kim & Song, 2015; Luo, 2011; Sommerville et al., 2005), gaze and emotional cues (Phillips, Wellman, & Spelke, 2002), and external constraints (Csibra, 2008; Liu & Spelke, 2017). Future research should investigate how these different cues are integrated, and which ones children prioritize at different ages.

A further avenue for future research is how children's understanding of goal abandonment relates to social learning. Children infer the value of goals on the basis of the costs that agents are willing to invest in the pursuit of those goals (Jara-Ettinger, Gweon, Tenenbaum, & Schulz, 2015; Liu, Ullman, Tenenbaum, & Spelke, 2017), but what do children infer about the value of goals that agents abandon? For example, they may interpret goal abandonment as stronger evidence that the goal is not worth pursuing as compared with the case in which the goal was never adopted in the first place. To what extent do children generalize such inferences about the values of goals toward other goals of similar types (Csibra & Gergely, 2009; Gergely & Csibra, 2005; Martin, Shelton, & Sommerville, 2017; Spaepen & Spelke, 2007)? For example, if children observe an agent abandoning the goal of acquiring an apple and infer that the goal is not valuable, will they extend this to the goal of acquiring other apples or other fruits? And do children infer long-standing psychological states (e.g., preferences) on the basis of goal abandonment (Hamlin, Wynn, & Bloom, 2007; Luo, Hennefield, Mou, van Marle, & Markson, 2017; Michael & Christensen, 2016; Sommerville & Crane, 2009)?

For the development of flexible social cognition and prosocial behaviors such as instrumental helping, it is important to be able to update representations of others' goals over time and to differentiate between abandoned and interrupted goals. The current findings provide the first evidence that children as young as 2 years have these abilities.

Acknowledgments

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jecp.2021.105171.

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