INFANCY

THE OFFICIAL JOURNAL OF THE INTERNATIONAL CONGRESS OF INFANT STUDIES

Infancy, 1–16, 2016

ISSN: 1525-0008 print / 1532-7078 online
DOI: 10.1111/infa.12143

WILEY Blackwell

Toddlers Help Anonymously

Robert Hepach and Katharina Haberl
Department of Developmental and Comparative Psychology
Max Planck Institute for Evolutionary Anthropology

Stéphane Lambert
Département d'études cognitives
CNRS, UMR8129, Institut Jean-Nicod, Ecole normale supérieure – PSL Research University

Michael Tomasello
Department of Developmental and Comparative Psychology
Max Planck Institute for Evolutionary Anthropology

Young children are extremely motivated to help others, but it is not clear whether they do so in anonymous situations without social recognition. In two studies, we found that 18-month-old toddlers provided help equally in situations where an adult recipient was present and in situations where an adult recipient was not present. We included several control conditions to rule out that toddlers were simply unaware of their anonymity or were merely motivated to restore the physical order of things. Together, these findings suggest that early in ontogeny children are motivated to help others in need regardless of whether they can immediately be recognized for their prosocial intentions.

Human adults are exceptionally helpful and often confer benefits to others without any chance of reciprocation, even when recipients are not present (Barmettler, Fehr, & Zehnder, 2012; Lamba & Mace, 2010; Sole, Marton, & Hornstein, 1975). Nevertheless, the interpretation of this behavior is controversial, as adults almost always act as although they are being watched, as even subtle cues, such as pictures of

Correspondence should be sent to Robert Hepach, Department of Developmental and Comparative Psychology, Max Planck Institute for Evolutionary Anthropology, 04103 Leipzig, Germany. E-mail: hepach@eva.mpg.de
We thank the families who participated in our studies, as well as Christian Biermann, Nadine Schumann, Katja Weber, Christian Kliesch, and Roger Mundry for their help with this project. In addition, we would like to thank Lucas Butler, Amrisha Vaish, and Malinda Carpenter for helpful comments and suggestions in preparation of the second study.

eyes, promote prosocial behavior (Bateson, Nettle, & Roberts, 2006; Haley & Fessler, 2005).

Children help others from as early as 12 months of age by providing helpful information and by assisting in the attainment of instrumental goals (Liszkowski, Carpenter, Striano, & Tomasello, 2006; Warneken & Tomasello, 2006). They also comfort those in distress (Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992) and share resources (Brownell, Svetlova, & Nichols, 2009; Svetlova, Nichols, & Brownell, 2010). Instrumental helping is an early emerging form of children's prosociality. Toddlers, unlike preschoolers or adults, help regardless of whether observers are encouraging or present and regardless of whether the recipient thanks and praises them (Warneken & Tomasello, 2008, 2013). Indeed, material rewards undermine young children's intrinsic motivation to help (Warneken & Tomasello, 2008), and toddlers proactively help even when the recipient is unaware of needing help (e.g., because she is temporarily facing away from the situation (Warneken, 2013). More specifically, 25- and 28-month-old children do not need explicit cues stating a need for help, for example, an extended arm, but will proactively resolve a situation for an adult. Helping rates in these cases are higher than in control situations where no help is needed (Warneken, 2013). Using a physiological measure, Hepach, Vaish, and Tomasello (2012) found that children's internal arousal states are similar whether they themselves help or a third party helps someone in need (and both differ from when the needy person receives no help). However, while previous work has ruled out third-party observer effects in young children's helping behavior, the recipient was always present when the need for help arose and could be made aware of the child providing help (Warneken, 2013) or acknowledge children's attempt to help (Hepach et al., 2012). In other words, while children at the age of two have been shown to help proactively (Warneken, 2013) and to want the person in need to be helped (Hepach et al., 2012), it is not known whether they would do so anonymously when the recipient is absent and cannot recognize their intention to help. Therefore, the question remains whether young children are primarily concerned with others' well-being or rather with "getting credit" for attempting to help.

In the current two studies, we systematically varied the degree of anonymity between the child and the recipient. If young children help out of a genuine concern for the person in need, we expected them to help regardless of whether the recipient could see them (Study 1) or whether the recipient had left the situation entirely and was outside the room when the need for help arose (Study 2).

STUDY 1

Children could help an adult with a task while we systematically varied the degree of anonymity. In the crucial anonymous condition, the child and recipient were not familiar with and could not see one another. To rule out that children were simply ignoring their anonymity with the adult, we included control conditions where we introduced the task as playing a game that was only engaging when both players could see each other. We predicted that the degree of anonymity would decrease children's playing but not helping behavior.

METHOD

Participants

Participants were 18-month-old children (n = 144, 72 boys) aged 18 months ± 1 month (*Median* = 18 months 11 days; *Min* = 17 months 0 days; *Max* = 19 months 14 days; *range*: 2 months 14 days). They were recruited from a local database of a mid-sized German city (see also Table 1 for more information). Eighteen additional children were tested but excluded due to parental interference (n = 3), experimenter error (n = 4), equipment error (n = 1), or because they did not want to participate (n = 10).

Materials and design

Each child went through a familiarization, a warm-up, a model, and a test phase. The warm-up and model phases were identical for all of the experimental conditions. Children were presented with either a male or a female adult experimenter during the test phase (order counterbalanced across participants). During the study, children played with an apparatus that was operated from two opposite ends (see Figure 1). On one side, the adult could drop an orange table tennis ball into a box, such that the ball rested upon a tilted board. The interior of the box was visible only from the child's side, and the only way to retrieve the ball was to lift the handle on the child's side. Two small cardboard boxes with a Velcro-lid and a small toy inside were used during the warm-up. Black duck tape marked an area on the carpet on the child's side of the apparatus (approximately 1.5 m × 1 m).

An additional distracter game (a sound-producing machine) was employed to keep children engaged throughout the study. Several curtains (height = 2.7 m) covering the

TABLE 1
Overview of the Number of Subjects in Study 1 with Their Respective Number of Siblings Separated by Subject Gender

	0 sibling	*1 sibling*	*2 or more siblings*
Female	44 (61%)	18 (25%)	10 (14%)
Male	33 (46%)	29 (40%)	10 (14%)

Figure 1 The apparatus used in study 1. The child stood on the side with the lever. On the adult's (the right side), a table tennis ball could be dropped into the apparatus such that it was only retrievable by pushing the lever on the child's side.

entire distance from the floor to the ceiling were used to section off a 2.25 m × 2.4 m area of the study room (see Figure 2 for details). If the curtains were closed, the child could not see into or enter the partitioned area. In a between-subject design, each participant was randomly assigned to one of six conditions, a combination of two independent factors: type of context (helping or playing) and degree of anonymity between the child and the experimenter: anonymous-adult, nonanonymous passive-adult, and nonanonymous active-adult (see Table 2).

Procedure

Two experimenters, one male and one female, ran the study. E1 (the partner) was responsible for familiarizing children with the apparatus while E2 (the recipient) carried out the actual test phase. Parents were informed about the general research scope of the study, and written informed consent was obtained before the study commenced. Parents were given a magazine to read and were asked to not provide their child with any cues and to not comment on the events during the study.

Familiarization and warm-up phase

In the anonymous-adult and passive-adult conditions, the partner interacted with the child while the recipient talked to the parent and did not engage with the child. If the child approached the recipient, she briefly acknowledged the child. In the active-adult conditions, both the partner and the recipient interacted with the child to an equal degree such that the child was equally familiar with both of them. The objective

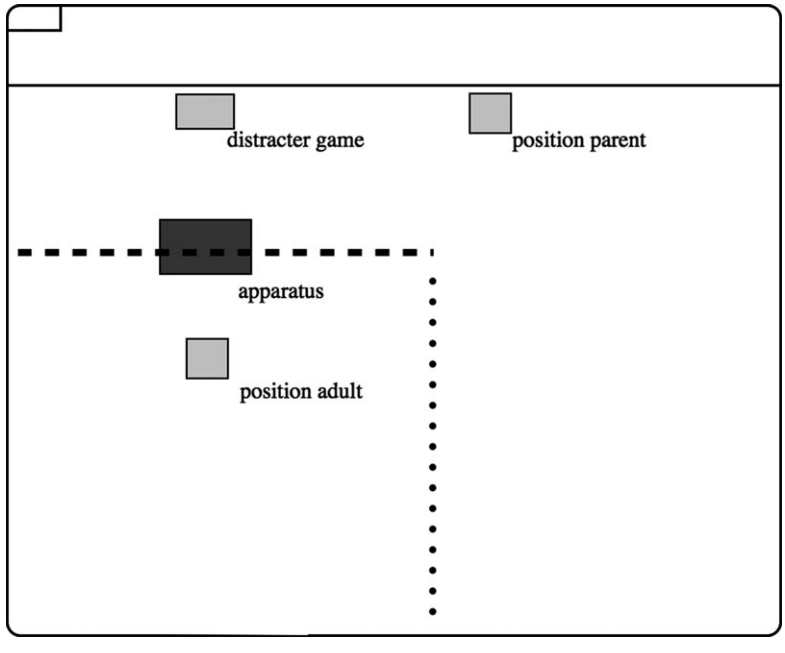

Figure 2 The curtain setup during study 1. The birds-eye view shows the setup during the anonymous-adult test phase. The dashed line indicates the curtain drawn both during the warm-up and during the test phase. The dotted line represents the curtain drawn only during the test phase.

TABLE 2
Description of the Different Experimental Conditions in Study 1 for the Test Phase

	Anonymous-adult condition	*Passive-adult condition*	*Active-adult condition*
Familiarization phase	The child is familiarized only with E1 but not with E2 who is the one present during the test phase.		The child is familiarized both with E1 and E2 who is present during the test phase.
Warm-up phase		Identical for all conditions.	
Model phase		Identical for all conditions.	
Test phase (helping or playing)	The child does not see the adult but can only hear her from behind a curtain.	The child can see the adult who does not engage with the child and does not make eye contact during the test phase.	The child can see the adult. In addition, the adult is engaging with the child making regular eye contact with children during the test phase.

of the subsequent warm-up phase was to further familiarize children with the curtains in the study room. The partner closed one part of the curtain (see Figure 2; dashed line) and showed the child one of the small cardboard boxes. He then invited children to open the box while quickly moving to the other side of the curtain, out of the child's view. Once behind the curtain, the partner verbally encouraged children to show what they had found inside the box and waited for children to move around to his side. Once children did so successfully, the partner moved the curtain back. The recipient excused herself and left the room.

Model phase

The objective of the model phase was to familiarize children with the apparatus used during the subsequent test phase. This phase differed between the helping and control scenarios but was identical with regard to how the degree of anonymity was established. Children participated in five consecutive model trials designed to make them understand how the apparatus worked and to encourage them to manipulate it themselves. In the helping conditions, the partner's activity consisted of cleaning up objects into a separate box. At one point, he accidentally dropped a ball into the apparatus (see *Materials and design*). The partner made a vain effort to retrieve it by extending the arm trying to reach the ball. The gesture was accompanied by facial and verbal cues expressing mild distress. The partner then waited for the child to lift the handle to return the ball.

In the playing conditions, the setup was a turn-taking game: The partner threw a ball into the apparatus and waited for the child to lift the handle to return the ball to the adult. In both the helping and playing model phases, the partner came to the child's side if they did not push the lever. Children were encouraged to lift it together with the partner, and in case the child did not do so, the partner pushed the lever and continued with the next model trial.

After the model phase, the partner introduced the child to the distracter game (see *Materials and design*) at a distance of 1.5 m away from the apparatus. The partner

then excused himself and left the room. In the anonymous conditions (both helping and playing), the partner, before leaving, closed the curtain such that one part of the room was separated (see Figure 2). Without the child noticing, the recipient entered the room behind the curtain. In the passive-adult and active-adult conditions (both helping and playing), the curtain remained open and the recipient entered in plain sight of the child after the partner had left the room. While the recipient took no notice of the child in the passive-adult conditions, they engaged in a natural interaction including making eye contact in the active-adult conditions.

Test phase

The actual test phase consisted of a series of four test trials. A trial started once the child was outside the marked area in front of the apparatus (see *Materials and design*). In the helping conditions, the recipient cleaned up objects until they accidentally dropped a ball into the apparatus such that it fell to the child's side out of the adult's view. The recipient extended the arm and reached into the apparatus for 15 sec or until the child lifted the handle. The recipient's verbal cues intensified from trial to trial as follows: "Oh. Oh!" (1st trial), "Oh, the ball. Oh, the ball." (2nd trial), "Oh, the ball is gone. Oh, the ball is gone." (3rd trial), and "Oh, the ball is gone. I want to have it back." (4th trial). In the playing conditions, the recipient did not reach for the ball but looked at her side of the apparatus after she intentionally threw the ball into the apparatus. She continued looking at the apparatus for 15 sec or until the child lifted the handle. The verbal cues were the same for each test trial: "There, the ball is in. There, the ball is in." In the anonymous condition (helping and playing), the child could not see the adult's extended arm but only her hand.

While the recipient could not see the child in the anonymous conditions, she never engaged or looked at the child in the passive-adult conditions but she did make eye contact with the child in the active-adult conditions at the beginning of each test trial. In all six conditions, whenever the child lifted the handle, the recipient briefly acknowledged the ball ("Ah, there is the ball.") but did not thank or look at the child. If children did not lift the handle, the adult stopped reaching (helping conditions) or waiting (playing conditions) and started with the subsequent test trial.

Coding and data analysis

A separate coder coded 80% of all trials (i.e., 116 of 144 participants with four test trials each). Reliability with the main coder was high, $K(Cohen) = .98$. The response variable was whether the child lifted the handle at least once (a binary score), and the independent factors of interest were type of context (helping or playing) and degree of anonymity (assigned numerical values: 3 = active-adult, 2 = passive-adult, and 1 = anonymous-adult). The interaction of type of context and degree of anonymity was entered into a full model along with participants' gender and experimenter identity during the test phase (female or male adult) as control variables. The statistical significance of type of context and degree of familiarity was established by comparing the full model to a reduced model that included only the control variables using a likelihood-ratio test (Dobson, 2002). Pairwise comparisons were computed using Fisher's exact tests.

To assess children's spontaneous behavior, we focused on the first half of the test phase (i.e., the first two test trials) for our main analyses. Preliminary analyses including all four test trials indicated that there was a statistical effect for an overall effect of type of context and degree of anonymity on children's motivation to push the lever and make the ball roll back to the adult at least once during the entire test phase, GLM: $\chi^2(3) = 9.25$, $R^2 = .09$, $p = .03$ (details provided in the Appendix S1). Boys (49 of 72; 68%) pushed the lever more often than girls (35 of 72; 49%), *Fisher's exact test*, $p = .028$. In addition, children operated the apparatus more often in the playing (49 of 72; 68%) compared to the helping context (35 of 72; 49%), *Fisher's exact test*, $p = .028$.

Two additional models investigated the effect of degree of anonymity separately within each type of context. Specifically, degree of anonymity was entered as a linear term to test our hypothesis that children's response should decrease with degree of anonymity in the playing conditions whereas this should not be the case in the helping conditions. For each analysis, we provide effect size estimates. Analyses were run using the statistics package R (Version 3.2.0).

RESULTS

There was an overall effect for type of context and degree of anonymity on children's motivation to lift the handle and make the ball roll back to the recipient,

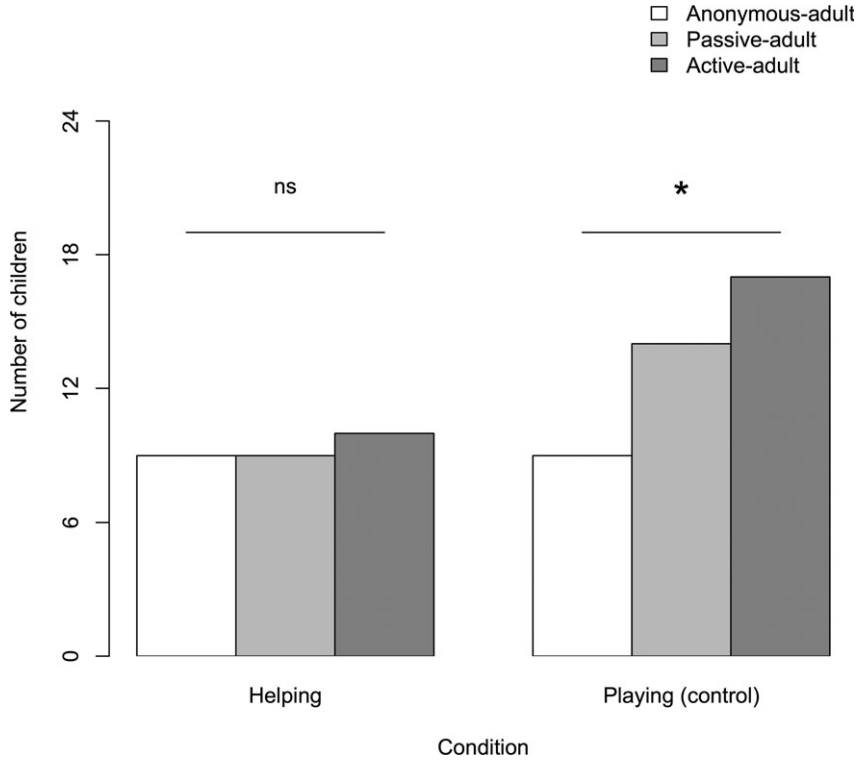

Figure 3 The results of study 1. *$p < .05$.

GLM: $\chi^2(3) = 10.17$, $R^2 = .09$, $p = .02$ (see Figure 3). Furthermore, within the playing context, children's propensity to push the ball back to the recipient increased linearly from the anonymous-adult to active-adult condition, $\beta = 0.72 \pm 0.31$, $z = 2.3$, 95% CI [0.12 1.37], $p = .021$. More children operated the lever in the context of playing when the recipient was active and engaging (17 of 24; 71%) compared to when they were passive (14 of 24; 58%) or anonymous (9 of 24; 38%). This was not the case within the context of helping where children's motivation to lift the handle did not change with degree of anonymity, $\beta = 0.1 \pm 0.31$, $z = .31$, 95% CI [−0.52 0.72], $p = .76$. Children were equally likely to retrieve the ball for the recipient when they were active and engaging (10 of 24; 42%), passive (9 of 24; 38%) or anonymous (9 of 24; 38%). Overall and regardless of the context, boys (41 of 72; 57%) were more likely to lift the handle than girls (27 of 72; 38%), LRT $\chi^2(1) = 5.98$, $p = .01$.

DISCUSSION

Children at the age of 18 months helped an adult to an equal degree whether they were familiar with the adult, whether the adult was unfamiliar and could see the child or whether the adult was unfamiliar and could not see the child. Toddlers helped in an immediate anonymous situation where the recipient could not immediately recognize them for their helpful intention. Children's motivation to help the adult was thus not motivated by a concern to be recognized. This is in line with previous work showing that 18- to 24-month-old toddlers help an adult irrespective of parental presence or encouragement (Warneken & Tomasello, 2013), without explicit cues for help by the recipient (Warneken, 2013), and that the underlying motivation for helping is a concern for the recipient's well-being (Hepach et al., 2012). The playing context in the present study further clarifies that this indifference to being seen by the recipient while helping is not due to the fact that children do not appreciate or ignore their familiarity with or the visibility of the recipient. When the situation is presented to children as a game which involves two parties playing rather than one helping the other, children were less motivated to respond to the adult's cues if she was unfamiliar and not visible.

In a subsequent study, we sought to follow up on this suggestive initial finding and to improve the methodological limitations of study 1. In the first study, we had used an apparatus that elicited overall low rates of responding in children. While these rates are still comparable in magnitude to previous studies using similar apparatuses (the "flap task" in Warneken & Tomasello, 2006), it is conceivable that the situation was too novel to elicit the rates of helping observed in more naturalistic tasks, such as an object dropping (Rheingold, 1982; Warneken & Tomasello, 2006). This may explain the pattern of results showing higher rates of pressing the lever in boys than in girls. It is possible that the apparatus was more similar to the kind of toys boys are commonly presented with compared to girls. A further limitation of study 1 was that the adult was present in the room albeit not visible through the curtains. In a more prototypical case of immediate anonymity, the recipient is completely absent at the time the problem occurs and is not aware of her need for help.

STUDY 2

We now further increased the degree of anonymity between the child and the adult. In the target condition, the adult was not present and did not witness the need for help. In two control conditions, the adult was either present but turned away or was absent yet no help was needed. Similar to study 1, we predicted that children's helping would not depend on whether the adult was present in the room, and that in both cases, rates of helping should be higher than in the no-need control. We conducted a pilot study to develop a paradigm in which children were comfortable with completing an adult's task while she was outside the study room, and to develop tasks that are more natural and intuitive for children as opposed to learning how an apparatus works (see Appendix S1 or details). To rule out that children were merely motivated to restore the physical order of things and henceforth pick up objects that accidentally dropped to the floor, we included a control condition in which the adult's goal was to discard objects. In this case, we hypothesized that children would be less motivated to pick up the dropped object.

METHOD

Participants

Participants were 18-month-old children (n = 48, 24 girls) aged 18 months ± 1 month (*Median* = 18 months 5 days; *Min* = 17 months 0 days; *Max* = 18 months 30 days; *range*: 1 month 30 days). They were recruited from a mid-sized German city (see also Table 3 for more information). Three additional children were tested but excluded due to parental interference (n = 1), experimenter error (n = 1), and because the child interfered with the experimental manipulation (n = 1).

Materials and design

The adult worked at a table (30 cm × 61.5 cm × 61.5 cm) that was equipped with a small block, hidden under the tablecloth that could be pulled with a transparent string from outside the study room. Four different tasks were used in the study (see Figure 4 for an example). The can-task consisted of five metal cans, the pictures-task included four small magnetic pictures that could be attached to a metal board (60 cm × 45 cm), the meadow-task consisted of four small toy animals, and the feeding-task included three small toy animals as well as three pieces of toy food. The objects were stored in a basket covered with a piece of cloth. Children were randomly assigned to one of the three conditions: recipient-present, recipient-absent, and recipi-

TABLE 3
Overview of the Number of Subjects in Study 2 with Their Respective Number of Siblings Divided by Subject Gender. For one Girl and one Boy, No Sibling Data were Available

	0 sibling	*1 sibling*	*2 or more siblings*
Female	12 (52%)	10 (43%)	1 (5%)
Male	13 (56%)	8 (35%)	2 (9%)

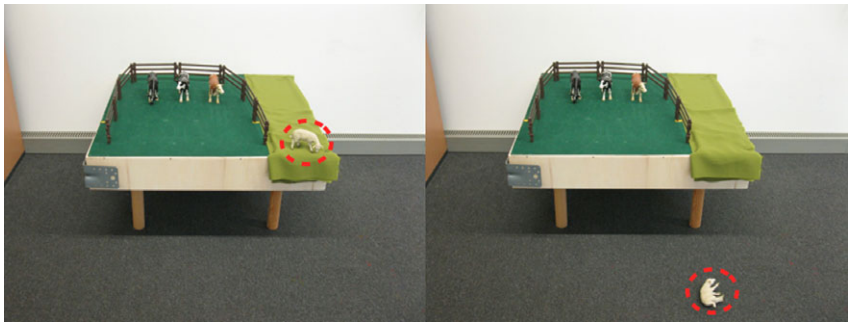

Figure 4 An example of one of the four tasks used in study 2 (i.e., the meadow task). The left image shows the setup before the experimental manipulation. The right image illustrates the setup after the respective object dropped to the floor.

ent-absent control (between-subject design, see Table 4). The order of the four tasks was counterbalanced across participants.

Procedure

The study was run by one male and one female experimenter. E1 carried out the task while the E2 called her/him from outside the room. Over the course of the four test trials, the experimenters took turns in carrying out the tasks. They rotated after each trial such that the adult who was potentially helped never reattended to the situation. The parent sat on a chair facing away from the situation. A small monitor not visible to the child allowed the parent to observe the entire study session.

Warm-up phase

Children were exposed to the toys and objects to be used later in the test trials to avoid effects of novelty during the study. The instructions for parents were the same as in study 1. The warm-up phase was the same for all children across the three experimental conditions.

TABLE 4
Description of the Different Experimental Conditions in Study 2 for the Test Phase

	Recipient-present	*Recipient-absent*	*Recipient-absent control*
Warm-up phase		Identical for all conditions.	
Test phase	Before called by her colleague, the adult states that she wants to continue assembling the objects. She remains in the room but turned away from the situation when the object drops.	Before called by her colleague, the adult states that she wants to continue assembling the objects. She leaves the room and is not present when the object drops.	Before called by her colleague, the adult states that she does not want to continue assembling the objects. She leaves the room and is not present when the object drops.

Test phase

E1 left the room while E2 introduced the child to the first task. Each task followed an identical structure and was carried out at the same table. In the meadow-task, the adult set up a fenced area and sequentially placed three toy cows and one toy sheep within the fenced area. In the feeding-task, the adult placed three toy horses on the table and fed them with two wooden carrots and one wooden apple. In the can-task, the adult aligned five cans in a row to close off the fenced area. For the pictures-task, the adult put up a metal board against the table and attached four magnetic pictures in a row. The adult made a content facial expression but did not interact with the child. With the final object in her/his hand, the adult said: "And this [object's name] I'll put here." placing the final item in its position. For 5 sec, all items were in their respective position. The crucial experimental manipulation occurred next. In the recipient-present and recipient-absent conditions, the adult nodded, picked up the last object again, and said "Yes, look [child's name] this [object's name] I'll place there." and motioning to the position they had just picked it up from. In the recipient-absent-control condition, the adult shook her/his head, picked up the last object, and said "No, no look [child's name] I'm not going to put the [object's name] here." and turned away to the basket from where they initially picked all the objects up.

At this point, E2 knocked at the door and called: "[E1's name] could you come out here?" to which E1 responded: "Yes, I'll be right there." Hereupon, the E2 called again with an impatient voice "[E1's name]!" E1 hesitated as if pausing in their movement, got up to walk towards the door, and in passing placed the object on the edge of the table saying: "Yes, I'm coming." In the recipient-absent and recipient-absent-control conditions, E1 left the room. In the recipient-present condition, E2, outside, handed her/him a piece of paper asking her to read it. E1 did so while turned away from the situation (2 m away from the table) with E1 remaining in the room within the child's view. After the door was closed again, E2 outside the room pulled the string (which caused the object to fall from the table) once the child attended to the situation on the table or after 20 sec had passed. After the child picked up the object and placed it on the table, E2 (who had remained outside the room for the entirety of the previous task) entered the room and attended to the situation. In the recipient-present condition, E1 left the room once the door was opened but did not look at the situation. If children did not pick up the object, E2 entered after 30 sec. The adult picked up the object on the floor and the objects on the table from the previous trial and placed them in a shelf out of children's reach. After each trial, the experimenters switched roles. It was always the experimenter who was outside the room during the experimental manipulation who entered at the end of the trial to clean up and start the subsequent game. The test phase ended after the fourth test trial.

Coding and data analysis

A separate coder coded a random sample of 25% of all participants. Reliability with the main coder was high, $K(Cohen) = .95$. The dependent measure was the binary coded variable whether or not children restored the situation. The independent factors were condition, and the control variables were gender as well as experimenter

identity (male or female) on the first test trial. The statistical model analyses were identical to those of study 1. Pairwise comparisons were computed using Fisher's exact tests.

Preliminary analyses incorporating all four test trials indicated that the propensity for children to put the dropped object back on the table varied between the experimental conditions, GLM: $\chi^2(2) = 9.75$, $R^2 = .26$, $p = .008$. There was no effect of gender or experimenter identity (see Appendix S1 for details). To directly compare the results of study 2 to those of study 1, we focused the main analyses on the first two test trials.

RESULTS

Children's motivation to pick up the dropped object was influenced by the type of experimental condition, GLM: $\chi^2(2) = 8.59$, $R^2 = .22$, $p = .01$ (see Figure 5). Children attempted to complete the adult's task at similar rates in the recipient-absent (12 of 16; 75%) and recipient-present (10 of 16; 63%) conditions, $p = .7$. Children in both conditions restored the situation more often compared to the recipient-absent control condition (4 of 16; 25%; recipient-absent vs. recipient-absent control, $p = .012$; recipient-present vs. recipient-absent control, $p = .073$). There was no effect of gender ($\chi^2(1) = 2.49$, $p = .11$) or the experimenters' identity ($\chi^2(1) = .0002$, $p = .99$).

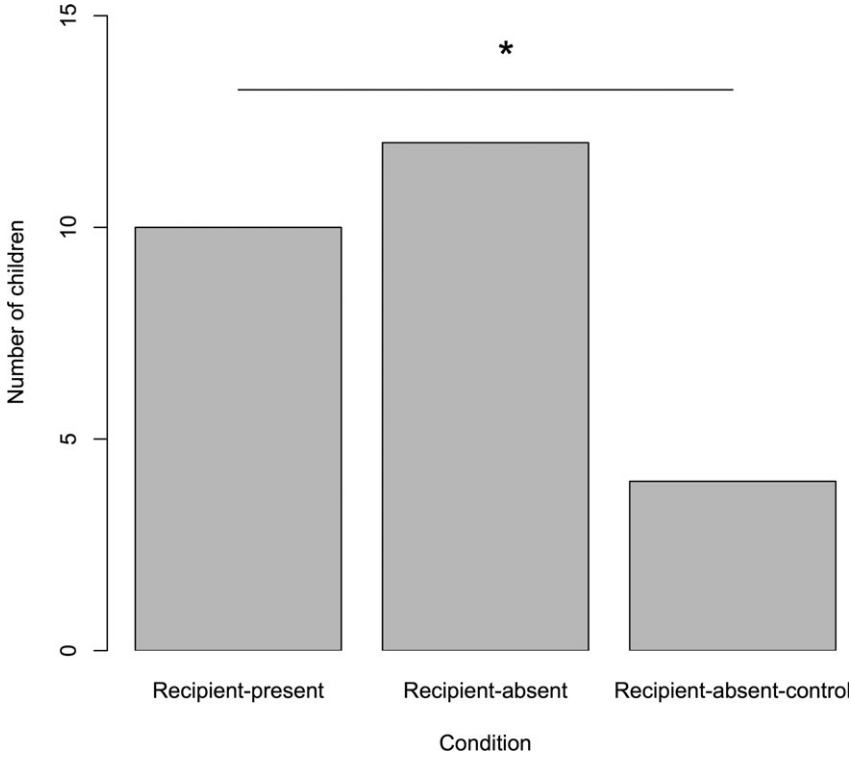

Figure 5 The results of study 2. *$p < .05$.

GENERAL DISCUSSION

Previous studies have shown that young children act prosocially in a variety of ways, but it is not clear whether they are helping mainly to receive recognition, and so only attempt to help when the recipient is present in the situation. In the first study, we systematically varied the degree of anonymity and found that children helped even when they and the recipient adult were not familiar with one another and could not see one another. In the second study in one target condition, the recipient was not present at all and did not return to the situation. Again the children helped in this anonymous situation even though the recipient did not know that she needed help. These results suggest that toddlers' helping behavior is not primarily motivated by a concern for recognition. Rather, young children appear to genuinely care for the person in need and seek to help her regardless of whether she is able to acknowledge their prosocial intention (Hepach, Vaish, & Tomasello, 2013; Warneken, 2015).

The two present studies varied in the conceptualization of an anonymous helping situation. In study 1, we wanted to rule out that toddlers are indifferent to their familiarity with the adult and the degree to which the two of them could see one another. For this purpose, and to visually separate the recipient adult and the child, we had to use a curtain setup in combination with a novel apparatus. The novelty of the apparatus and of the situation as a whole may have resulted in the overall low rates of children's responding although the rates are comparable to similar apparatuses used in previous work (e.g., Warneken & Tomasello, 2006). Nevertheless, the crucial finding was that children's motivation to operate the apparatus was unaffected by the degree of anonymity in the context of helping, whereas it did vary in the context of playing. Based on this initial finding, we improved the method in the second study creating situations that were more natural situations for toddlers, for example, objects dropping to floor. This resulted in (1) overall higher rates of responding, and (2) in a stronger statistical effect of experimental conditions not only on children's spontaneous helping but also their overall helping across the entire test session.

It is noteworthy that whereas in study 1 we found boys to operate the apparatus more often than girls, there were no gender effects in study 2. The latter finding is in line with previous work on toddlers' instrumental helping (e.g., Warneken, 2013). In study 1, boys were more motivated to operate the apparatus in both the helping and the playing contexts. Thus, the gender effect is not specific to helping situations. It is possible that boys enjoyed pushing the lever more than girls similar to 6- and 9-month-old boys imitating propulsive actions more than girls (Benenson, Tennyson, & Wrangham, 2011; see Alexander & Wilcox, 2012; Christov-Moore et al., 2014; for a more general review of gender effects). In a similar vein, the current results were obtained in a Western population of toddlers. The effects of familiarity and anonymity may be quite different in other cultures or even vary within the same culture, for example, as a factor of socioeconomic status (e.g., Miller, Kahle, & Hastings, 2015). However, based on the current results, this interpretation is speculative and more research is needed to clarify the role of such factors including gender in children's prosocial behavior.

In the present studies, we focused on one particular type of helping behavior, that is, instrumental helping. An alternative explanation for this behavior may be that children are motivated to restore the physical order of things or to "clean up" rather than

being concerned with another's unfulfilled need. The results of the present studies are incompatible with this alternative interpretation. If children's helping behaviors were driven by the misplaced or dropped object (the ball dropping in study 1 and the object dropping in study 2), then children's rate of responding (pushing the lever in study 1 and picking up the object in study 2) should have been similar across experimental conditions. However, this was not the case in either study. In study 1, children were sensitive to whether they could actually see the recipient in playing scenarios whereas this did not matter in the helping scenarios. Similarly, in study 2, children did not restore the physical order of things and left the misplaced object on the ground if the adult's goal was to discard it (see also Warneken, 2013). These findings are in line with previous work showing that toddlers will not pick an object if the adult discarded it intentionally (Warneken & Tomasello, 2006). Similarly, when an adult reaches ambiguously for two objects, 24-month-old children will provide the object that is in line with the previously established goal or need (Hepach, Vaish, Grossmann, & Tomasello, in press; Hobbs & Spelke, 2015).

A further alternative explanation of toddlers' helping behavior is a potential motivation to be recognized for their helpful behavior (see Paulus, 2014; Warneken, 2013 for reviews). At an age of 18 months, this needs not be a strategic motive but can rather manifest itself in a motivation to ostensibly attempt to help. Based on the present findings, this interpretation is unlikely. Even when we created a situation in which the recipient adult was not present at the time of the problem occurring and did not return to the situation, toddlers were equally likely to help her compared to when she was present in the room. Without the adult present in the room at the time of the object dropping and without her immediately returning, children could not inform her about their helpful act, hence their helping is anonymous.

This conceptualization of anonymity can be referred to as immediate anonymity: At the moment when children have the opportunity to help, no individual other than themselves can perceive them helping. This is different from notions of ultimate anonymity: Can anyone ever find out about one's helpful behavior? This latter formulation of anonymity includes a more strategic component and involves more deliberation, for example, whether there will be an opportunity in the future to communicate to others one's helpful behavior. It is possible that as children grow older, they are more sensitive to how others perceive them and may be less inclined to provide help in contexts that provide no opportunity for immediate recognition. This is certainly an interesting avenue for future research. Equally important is the question of how infants represent the knowledge state of the recipient. Previous work suggests that 15-month-old infants flexibly represent knowledge states of adults in implicit false-belief tasks (e.g., Onishi & Baillargeon, 2005) and active helping paradigms, where the agent does not know about the function of an apparatus (Warneken & Tomasello, 2006) or the location of an object (Buttelmann, Carpenter, & Tomasello, 2009). In all cases toddlers, by the age of 18 months, are sensitive to the goal an agent is pursuing. In the present study 2, children were attending to the adults' goal such that in the recipient-absent control condition, they did not pick up the dropped object. There are also cases where children realize when an adult's knowledge state conflicts with their own such that they will correct an adult's request for a dysfunctional object (Martin & Olson, 2013). One possible avenue for future research is to systematically investigate toddlers' sensitivity to others' goals and knowledge states using eye tracking paradigms, possibly in combination with behavioral measures.

The result that 18-month-old children are equally motivated to help in anonymous and non-anonymous situations provides a crucial piece of the puzzle in the origins of human altruistic helping behavior. Together with previous work, the findings of the present studies converge on the interpretation that, at an age of 2 years, children's helping is proactive (Warneken, 2013), intrinsically motivated (Warneken & Tomasello, 2008), driven by a concern for another's well-being (Hepach et al., 2012, 2013), and occurs even in situations where children cannot be immediately recognized for their helping behavior. At the same time, instrumental helping is one of the many facets of early emerging prosociality (e.g., Dunfield, 2014) that may represent a low-cost way for children to benefit others. Children's motivation to help can differ between various helping domains and change across development such that, with increasing age, multiple motives may underlie their prosocial behavior (Eisenberg & Spinrad, 2014). In particular, children's motivation to help at a cost and behaving morally become beneficial given the increasing dependence on cooperating with unrelated and/or unfamiliar individuals who may be untrustworthy (Sheskin, Chevallier, Lambert, & Baumard, 2014; Warneken & Tomasello, 2009). Consistent with this life history analysis, sharing a resource may be more susceptible to observer effects such that older children, in particular, from the age of five, attempt to manage their reputation and may be less inclined to help if the possibility for being recognized is not given, that is, when the recipient is absent (Engelmann, Over, Herrmann, & Tomasello, 2013; Leimgruber, Shaw, Santos, & Olson, 2012).

In sum, 18-month-old toddlers help others in anonymous situations. The results from the present studies suggest that, early in ontogeny, concerns to receive recognition for helping are neither foundational nor facilitative of toddlers' prosocial behavior.

REFERENCES

Alexander, G. M., & Wilcox, T. (2012). Sex differences in early infancy. *Child Development Perspectives*, *6* (4), 400–406.

Barmettler, F., Fehr, E., & Zehnder, C. (2012). Big experimenter is watching you! Anonymity and prosocial behavior in the laboratory. *Games and Economic Behavior*, *75*(1), 17–34.

Bateson, M., Nettle, D., & Roberts, G. (2006). Cues of being watched enhance cooperation in a real-world setting. *Biology Letters*, *2*(3), 412–414.

Benenson, J. F., Tennyson, R., & Wrangham, R. W. (2011). Male more than female infants imitate propulsive motion. *Cognition*, *121*(2), 262–267.

Brownell, C., Svetlova, M., & Nichols, S. (2009). To share or not to share: When do toddlers respond to another's needs? *Infancy*, *14*(1), 117–130.

Buttelmann, D., Carpenter, M., & Tomasello, M. (2009). Eighteen-month-old infants show false belief understanding in an active helping paradigm. *Cognition*, *112*(2), 337–342.

Christov-Moore, L., Simpson, E. A., Coudé, G., Grigaityte, K., Iacoboni, M., & Ferrari, P. F. (2014). Empathy: Gender effects in brain and behavior. *Neuroscience & Biobehavioral Reviews*, *46*, 604–627.

Dobson, A. J. (2002). *An introduction to generalized linear models*. Boca Raton: Chapman & Hall/CRC.

Dunfield, K. A. (2014). A construct divided: Prosocial behavior as helping, sharing, and comforting subtypes. *Frontiers in Psychology*, *5*, 111–123.

Eisenberg, N., & Spinrad, T. L. (2014). Multidimensionality of prosocial behavior. In L. M. Padilla-Walker, & G. Carlo (Eds.), *Prosocial development: A multidimensional approach* (pp. 17–39). New York: Oxford University Press.

Engelmann, J. M., Over, H., Herrmann, E., & Tomasello, M. (2013). Young children care more about their reputation with ingroup members and potential reciprocators. *Developmental Science*, *16*(6), 952–958.

Haley, K. J., & Fessler, D. M. T. (2005). Nobody's watching? Subtle cues affect generosity in an anonymous economic game. *Evolution of Human Behavior*, *26*, 245–256.
Hepach, R., Vaish, A., Grossmann, T., & Tomasello, M. (in press). Young children want to see others get the help they need. *Child Development*.
Hepach, R., Vaish, A., & Tomasello, M. (2012). Young children are intrinsically motivated to see others helped. *Psychological Science*, *23*(9), 967–972.
Hepach, R., Vaish, A., & Tomasello, M. (2013). A new look at children's prosocial motivation. *Infancy*, *18* (1), 67–90.
Hobbs, K., & Spelke, E. S. (2015). Goal attributions and instrumental helping at 14 and 24 months of age. *Cognition*, *142*, 44–59.
Lamba, S., & Mace, R. (2010). People recognise when they are really anonymous in an economic game. *Evolution and Human Behavior*, *31*(4), 271–278.
Leimgruber, K. L., Shaw, A., Santos, L. R., & Olson, K. R. (2012). Young children are more generous when others are aware of their actions. *PLoS One*, *7*(10), e48292.
Liszkowski, U., Carpenter, M., Striano, T., & Tomasello, M. (2006). Twelve- and 18-month-olds point to provide information for others. *Journal of Cognition and Development*, *7*, 173–187.
Martin, A., & Olson, K. R. (2013). When kids know better: Paternalistic helping in 3-year-old children. *Developmental Psychology*, *49*(11), 2071.
Miller, J. G., Kahle, S., & Hastings, P. D. (2015). Roots and benefits of costly giving children who are more altruistic have greater autonomic flexibility and less family wealth. *Psychological Science*, *26*, 1038–45.
Onishi, K. H., & Baillargeon, R. (2005). Do 15-month-old infants understand false beliefs? *Science*, *308*, 255–258.
Paulus, M. (2014). The emergence of prosocial behavior: why do infants and toddlers help, comfort, and share?. *Child Development Perspectives*, *8*(2), 77–81.
R Core Team (2015). R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing. URL https://www.R-project.org/.
Rheingold, H. L. (1982). Little children's participation in the work of adults, a nascent prosocial behavior. *Child Development*, *53*, 114–125.
Sheskin, M., Chevallier, C., Lambert, S., & Baumard, N. (2014). Life-history theory explains childhood moral development. *Trends in Cognitive Sciences*, *18*(12), 613–615.
Sole, K., Marton, J., & Hornstein, H. (1975). Opinion similarity and helping: Three field experiments investigating the bases of pro- motive tension. *Journal of Experimental Social Psychology*, *11*(1), 1–13.
Svetlova, M., Nichols, S. R., & Brownell, C. A. (2010). Toddlers' prosocial behavior: From instrumental to empathic to altruistic helping. *Child Development*, *81*(6), 1814–1827.
Warneken, F. (2013). Young children proactively remedy unnoticed accidents. *Cognition*, *126*(1), 101–108.
Warneken, F. (2015). Insights into the biological foundation of human altruistic sentiments. *Current Opinion in Psychology*, *7*, 51–56.
Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science*, *311*, 1301–1303.
Warneken, F., & Tomasello, T. (2008). Extrinsic rewards undermine altruistic tendencies in 20-month-olds. *Developmental Psychology*, *44*(6), 1785–1788.
Warneken, F., & Tomasello, M. (2009). Varieties of altruism in children and chimpanzees. *Trends in Cognitive Science*, *13*, 397–402.
Warneken, F., & Tomasello, M. (2013). Parental presence and encouragement do not influence helping in young children. *Infancy*, *18*(3), 345–368.
Zahn-Waxler, C., Radke-Yarrow, M., Wagner, E., & Chapman, M. (1992). Development of concern for others. *Developmental Psychology*, *28*(1), 126–136.

SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article:

Appendix S1. Details regarding methods and analyses.