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# Young Children Choose to Inform Previously Knowledgeable Others

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Children recognize that people who know more are better informants than those who know less. How does an individual's prior knowledge affect children's decisions about whom to inform? In 3 experiments, 3- to 6-year-old children were invited to share a novel piece of information with 1 of 2 potential recipients who differed in their recent history of knowledge. Children tended to inform the previously knowledgeable person rather than the previously ignorant person. This same effect was observed in a 4th experiment when the knowledgeable person stated that she already knew the information the participant had to share. In no case was the opposite pattern observed: Children never chose to inform the person who had known less. These results seem to conflict with equity considerations and may reflect a preference to affiliate with competent social partners.

Young children benefit greatly from other people's teaching. By watching and listening to members of their culture, children learn what various objects are called, when certain behaviors are appropriate, and how different things work (Harris, 2012). Learning from others is a hallmark of our species and a fundamental mechanism of cognitive development and enculturation. Humans are also distinguished, however, by our ability and disposition to teach. Young children spontaneously instruct others and participate in information exchanges that go well beyond anything observed in other species; indeed, sharing information may be among the earliest emerging forms of collaborative interaction (Tomasello, 2009). A considerable body of research has described children's selective use of information received from others (see Harris, 2012), but much less is known about children's strategies for providing information to others. When a child shares her knowledge with another individual, how does she decide to whom to tell what?

A robust finding in the literature on social learning is that children are selective consumers of instruction. For example, young children trust information provided by people who have demonstrated knowledge rather than ignorance in the past (Birch, Vauthier, & Bloom, 2008; Harris, 2012; Harris & Corriveau, 2011; Koenig, 2010). Given the vast array of potential teachers, such selectivity maximizes children's chances of learning correct or important

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information. Just as children are confronted with many possible instructors, they also encounter many possible instructees: How do they decide where to direct their teaching efforts? In the present research, we focused specifically on one distinction between potential targets of teaching —a recent history of knowledge versus ignorance—and asked whether this difference would guide 3- to 6-year-old children's sharing of a novel piece of information.

Compared with research on children's selective learning, the literature on children's selective informing is limited in scope. Thus, a primary goal of the present work was simply to ask whether children are selective informers, in addition to exploring one dimension that might guide their selection process. We first review findings from studies of children's selective learning, which demonstrate that young children can track and act on information about who is knowledgeable and who is ignorant. We then review the smaller literature on children's informing, describe our method, and offer predictions for children's behavior in the present experiments.



## Selective Learning

Young children consider knowledge differences when they are the targets of others' teaching. Numerous studies have provided evidence that preschool-age children selectively learn from those who are knowledgeable and those who have provided accurate information in the past; further, children often avoid learning from those who are ignorant and those who have provided inaccurate information in the past (e.g., Birch et al., 2008; Corriveau & Harris, 2009; Koenig & Harris, 2005; Sabbagh & Baldwin, 2001; Sabbagh & Shafman, 2009). Young children also understand that people can differ in how much knowledge they possess in specific domains (Danovitch & Keil, 2004; Lutz & Keil, 2002) and often trust those who have relevant expertise (e.g., Jaswal & Neely, 2006; Sobel & Corriveau, 2010; VanderBorght & Jaswal, 2009). Children's responses to knowledgeable others can be subtle, as in choosing to whom to attend or whom to believe (e.g., Birch et al., 2008; Koenig & Harris, 2005), or they can involve more interactive and social behaviors, such as directing information-seeking questions to expert, knowledgeable, and previously accurate speakers (e.g., Danovitch & Keil, 2004; Koenig & Harris, 2005; Mills, Legare, Grant, & Landrum, 2011; Sobel & Corriveau, 2010).

Other factors (e.g., preexisting biases about correct responses) can certainly influence children's tendency to accept testimony offered by reliable individuals and reject testimony offered by unreliable individuals (Boseovski, 2012; Jaswal, McKercher, & VanderBorght, 2008; Nurmsoo & Robinson, 2009; Palmquist & Jaswal, 2012). Nonetheless, children recognize from an early age that another person's knowledge status is an important element of his or her value as an informant.

Young children's preference for knowledgeable others extends beyond seeing them as good sources of information. For example, children ascribe positive attributes (e.g., being nice) to people who are knowledgeable (Brosseau-Liard & Birch, 2010). Conversely, 3- to 4-year-old children ascribe knowledge to people with positive qualities (Lane, Wellman, & Gelman, 2013). Thus, studies of children's selective learning and studies of children's trait inferences suggest that children track who is knowledgeable and who is ignorant, and children may be more positively disposed toward the former than the latter.

## Selective Informing

A handful of studies have shown that young children tend to provide information to those who lack it. Three- to 6-year-old children assert that teaching should be directed toward someone who does not know the content being taught rather than toward someone who does already know (Ziv & Frye, 2004). In addition, children as young as 3 years of age adjust their conversation according to the competence of their conversational partners and give more help or support to those who need it (Shwe & Markman, 1997; Shatz & Gelman, 1973). More recently, research has shown that even infants consider another person's knowledge status when providing information: Twelve-month-old infants are more likely to direct an adult's attention to a hidden object for which the location is unknown (vs. known) by that adult (Liszkowski, Carpenter, & Tomasello, 2008). One interpretation is that young children use informing as a way of providing help and sharing information with those who need it.

## The Present Research

Studies on children's selective informing often present children with scenarios where people are either ignorant or knowledgeable about a specific piece of information; in these cases, children tend to provide information to those who lack it. On the other hand, studies of children's selective learning typically present children with people who have displayed general knowledge or ignorance in the past but whose knowledge of some fact in question is unknown; in these cases, children tend to learn from those who have demonstrated greater knowledge in the past. This difference can be characterized as "specific" versus "general" knowledge and ignorance. Here, in Experiment 1, we focus on the case of general knowledge versus general ignorance in the context of children's selective informing. Often a person's knowledge state about a particular fact is unknown and multiple people can express ignorance. How do children choose to share information when specific knowledge is either unknown or does not distinguish potential recipients? Do children tend to inform people who have generally known more in the past, or do they tend to inform those who have generally known less?

In Experiment 1 of the present research, children first encountered two people: a "knowledgeable" adult who successfully identified several different objects and an "ignorant" adult who failed to make correct identifications. Then, participants proceeded to a test phase in which both adults indicated that they did not know the identity of a series of unfamiliar objects. Participants learned the relevant information and were then invited to inform just one of the adults. The use of a forced-choice procedure in which the actors differed in only one respect (i.e., knowledge status) allowed us to isolate whether children prioritize knowledge or ignorance when deciding whom to inform.

The limited literature on children's informing, reviewed earlier, suggests that children tend to provide information to those who lack it. In Experiment 1, both people are equally in need of information during the test phase; thus, children may be equally likely to provide information to either person. In addition to providing people with information they lack in the moment, however, children may also wish to select generally ignorant people as the targets for their teaching, perhaps because such individuals are most in need of help; thus, a second possibility is that children will tend to inform the previously ignorant person. Such a strategy would tend to

equalize knowledge across potential recipients and would be consistent with concerns about fairness. Conversely, children may provide information to the previously *knowledgeable* person: Just as children preferentially learn from and interact with people who know more, they may also preferentially inform those who know more.

Experiment 1 included a group of younger children (3 and 4 years of age) and a group of older children (5 and 6 years of age). Although studies on children's selective learning have demonstrated that children as young as 3 years of age preferentially learn from knowledgeable informants (e.g., Birch et al., 2008), other research has also shown that 5- to 6-year-old children have a better understanding of knowledge, ignorance, and teaching than do 3- to 4-year-old children (Ziv & Frye, 2004). Moreover, these older children have been shown to be less likely to associate knowledge with general positive traits (Lane et al., 2013). Thus, we included both younger and older participants and reasoned that they might respond differently to global differences in knowledge perhaps because of age-related advances in their ability to think about others' minds and understand teaching.



## EXPERIMENT 1

Experiment 1 tested whether children consider individuals' past demonstrations of knowledge or ignorance when deciding whom to inform. Participants met a "knowledgeable" adult, who succeeded in identifying objects requested by a third party (named "Sally"), and an "ignorant" adult, who failed to identify the correct referent of requests. Following this, both the knowledgeable adult and the ignorant adult expressed ignorance about the referent of a new request, and participants had the opportunity to provide the needed information to one of the two adults.

### Method

#### *Participants*

The participants were sixteen 3- to 4-year-old children (9 girls, 7 boys; $M_{age}$ = 4;2; range = 3;5–4;11) and sixteen 5- to 6-year-old children (6 girls, 10 boys; $M_{age}$ = 6;0; range = 5;1–6;11). Six additional children participated in the experiment, but their responses are excluded from the analyses: Two children failed the manipulation check (described in the subsection "establishment phase"), 1 child thought 1 of the actors was her cousin (and therefore could not focus on the task), and the remaining 3 children were excluded because of experimenter error.

#### *Apparatus and Materials*

The experiment was presented on a computer monitor. Video clips of two White female actors (matched for age, attractiveness, and height) appeared in the center of the monitor. The actors were seated at identical desks, facing slightly away from each other. An opaque vertical tube and small table were located halfway between the actors' desks, and a translucent drawer on each desk contained several objects. A red button used for "calling" Sally appeared above the video display, while buttons used for "calling" the actors appeared below the video display (see Figure 1). The experimenter controlled the presentation using a hidden remote.

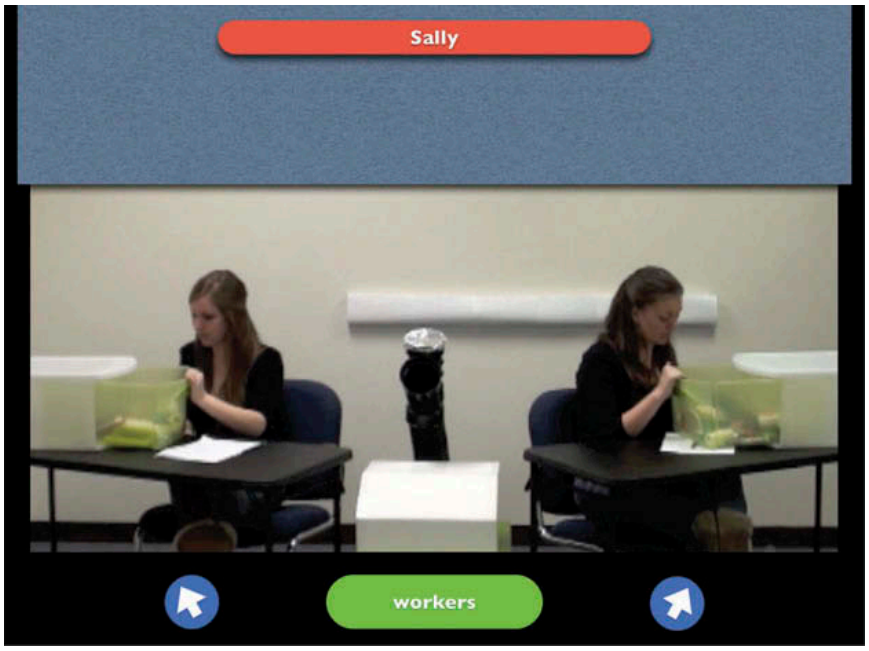


FIGURE 1 An example display from the test phase of Experiment 1. The actors are looking at the objects in their drawers.



Participants saw unfamiliar objects during the establishment and test phases of the experiment. Establishment-phase objects included a ladle, an attached pair of tongs, a table clamp, a metal gauge, a tea infuser, and a circular red reflector. Test-phase objects included a blue-and-white cylinder ("toma"), a green knob with an attached sponge ("medo"), a green and yellow avocado slicer ("zav"), and a red-topped paint stirrer ("fep"). We selected unusual objects so that it would seem plausible to children that an adult might not know the proper labels for them. Pretesting revealed that these objects were not consistently labeled by children. During the test phase, children saw photographs of the test objects in a "picture dictionary."

### *Procedure and Design*

Participants sat in front of a computer monitor next to an experimenter. Although all the audio and video clips used in the experiment were prerecorded, the procedure was designed to appear live to participants: The third parties all seemed to interact contingently with the child and experimenter throughout the testing session (e.g., looking up and waving when the experimenter introduced the child).

The experiment consisted of a short introduction, an establishment phase (four trials), a manipulation check, and a test phase (four trials).

*Introduction.* At the beginning of the session, the experimenter explained to the child that they were going to be talking with a person named "Sally" who needed their help. The experimenter demonstrated how to call Sally by touching the red button at the top of the

computer screen and talking in the direction of the computer, which initiated a brief, apparently live conversation with Sally. Then, the experimenter explained that she and the child were going to help Sally get some things that she needed, which were located in another room down the hall. The experimenter told the child that she had set up a camera in the room where these objects were stored and then pushed a button on the computer to reveal a video of the two actors seated their desks. The experimenter introduced the child to the actors (e.g., "Hi, guys. This is Mary."), at which point the actors looked up and said, "Hi!" Finally, the experimenter explained the mechanics of the task to the child by pointing to various parts of the video and saying, "See those drawers? That's where they keep all of the office things. In a little bit, Sally's going to call us and tell us which thing she needs, and then we're going to tell these guys so they can send it to Sally down that tube."

*Establishment phase.* The establishment phase served to demonstrate that one actor was consistently knowledgeable about objects and their labels, while the other actor was consistently ignorant about objects and their labels. Sally called the office on four separate occasions to request one of four objects. The initial events for each request were the same: A bell rang to signal a call from Sally; the experimenter (or the child) answered the call; Sally said, "Hi, this is Sally. I'm looking for a [ladle]. I know it's in that room. Can you send it to me?"; and the experimenter relayed Sally's message to the actors by calling their room.

The two actors took turns answering requests across the four trials. When the knowledgeable actor answered the call from the experimenter, the actor said, "Sally needs a [ladle]. I really want to find it for her. I know what a [ladle] is." The knowledgeable actor then searched for the object in her drawer; held it up in front of her, saying, "Here it is. This is the [ladle]"; put the object down the tube; and then sat back down at her desk. By contrast, when the ignorant actor answered the call, she said, "Sally needs a [ladle]. I really want to find it for her. I don't know what a [ladle] is." The ignorant actor then searched for the object in her drawer; held up the wrong object (e.g., a tea infuser), saying, "Maybe this is the [ladle]"; put the object down the tube; and returned to her desk.

Immediately after an actor put an object down the tube, the experimenter invited the child to help her confirm whether Sally received the correct object, saying, "Let's check to see if Sally got what she wanted." After the experimenter (or the child) pressed the red button to call Sally, the experimenter then asked, "Sally, did you get the [ladle]?" On trials featuring the knowledgeable actor, Sally said, "Yes, that's the [ladle]. That's what I asked for. Thanks for the help! That [ladle] is just what I needed." On trials featuring the ignorant actor, Sally said, "No, that's not the [ladle]. That's not what I asked for. Thanks for the help. I don't need the [ladle] anymore."

At the end of each of the four establishment trials, the experimenter asked the child, "So did she send Sally the right thing or the wrong thing?" All children provided the correct answer on all four trials. Following the four establishment trials, the experimenter conducted a brief manipulation check by asking, "During this whole time, who did a good job of getting the right things for Sally?" All children whose responses are included in analyses pointed to the knowledgeable actor.

In the establishment phase, the following factors were counterbalanced across participants: the order in which Sally requested the four objects, the association of each object with the

knowledgeable actor or the ignorant actor, the order in which the knowledgeable actor and the ignorant actor answered Sally's requests, the lateral positions of the knowledgeable actor and ignorant actor, and the identity of the knowledgeable and ignorant actors.

*Test phase.* During the test phase, Sally again requested four objects on four separate occasions. However, in the test phase, all of the objects were unfamiliar to children and neither actor appeared to know the identity of the objects Sally wanted. On each trial, a bell rang to signal a call from Sally, and the experimenter answered the call. Then, the experimenter asked the child to predict which actor would know the object, saying, "Did you hear that? Sally needs a [fep]. I'm just wondering, who do you think knows what a [fep] is? Can you point?" Then, the experimenter asked both of the actors if they knew the identity of the requested object, saying, "Hey, guys. Sally is looking for a [fep]. Do you guys know what a [fep] is?" In response, both actors expressed ignorance by shaking their heads and then began searching for the object in their drawers.

After reiterating to the child that neither actor knew the identity of the requested object, the experimenter took out a picture dictionary and thumbed through it until she landed on the appropriate page. At this point, she said to the child, "Look, I found it! This is a [fep]. This is what Sally is asking for. They both don't know what a [fep] is. But I know that they both have one of these in their drawers. You can tell one of them. Who do you want to tell?" Meanwhile, the actors continued to search for the object in their drawers. After the child pointed to one of the actors, the experimenter asked the child to hold up the card from the picture dictionary to the screen for the chosen actor to "see."

While the child was holding up the card, the experimenter said, "This is a fep," and the chosen actor looked up and said, "Oh, the [fep]. Thank you!" She then retrieved the matching object from her drawer and put it down the tube. During this time, the other actor continued to search for the object in her drawer and stopped when she heard the noise of the object being put down the tube. Then, following the same procedure used in the establishment trials, the experimenter called Sally and asked if she received the object, and Sally confirmed that she received the correct object. The order in which Sally requested the different unfamiliar objects across the four test trials was counterbalanced across children.

### Scoring and Analysis Strategy

Children's selection of the previously knowledgeable actor was scored as "1," and their selection of the previously ignorant actor was scored as "0." Responses of "neither," "both," or "I don't know" were eliminated from all analyses. Children made clear predictions of which actor would know on 80% of all trials (94% on the first trial). For the informing questions in the test phase, all participants chose one actor or the other each time they were asked (see "Giving Information" section).

Recall that both actors were equally ignorant across all trials in the test phase. The actors' overall knowledge difference was therefore most prominent in Trial 1. Thus, in addition to analyses focused on children's mean responses across the four trials, we conducted analyses on children's responses in Trial 1 separate from Trials 2 through 4.

## Results

### *Predicting Knowledge*

Children predicted that the previously knowledgeable actor would know the referent during test trials (chance = .5; *M* score across all trials = 0.82), $t(31) = 7.18$, $p < .001$, $d = 1.27$. Both younger and older children selected the knowledgeable actor at rates greater than expected by chance: younger, *M* score = 0.81, $t(15) = 4.70$, $p < .001$, $d = 1.17$; older, *M* score = 0.82, $t(15) = 5.34$, $p < .001$, $d = 1.27$. The majority of children indicated that the previously knowledgeable actor would know the object's identity on Trial 1 ($N = 29$ out of 30 children; $p < .001$, binomial test), as well as on later trials (*M* score for Trials 2–4 = 0.72), $t(28) = 3.38$, $p = .002$, $d = 0.63$.

### *Giving Information*

Figure 2 presents participants' choices. Overall, children chose to give information to the knowledgeable actor (chance = .5; *M* score across all trials = 0.69), $t(31) = 4.18$, $p < .001$, $d = 0.74$. Younger children were significantly more likely to teach the previously knowledgeable person than were older children (*M* = 0.78 vs. 0.59), $t(30) = 2.22$, $p = .03$, $d = 0.78$. Nevertheless, both younger and older children selected the knowledgeable actor at rates that exceeded chance: younger,

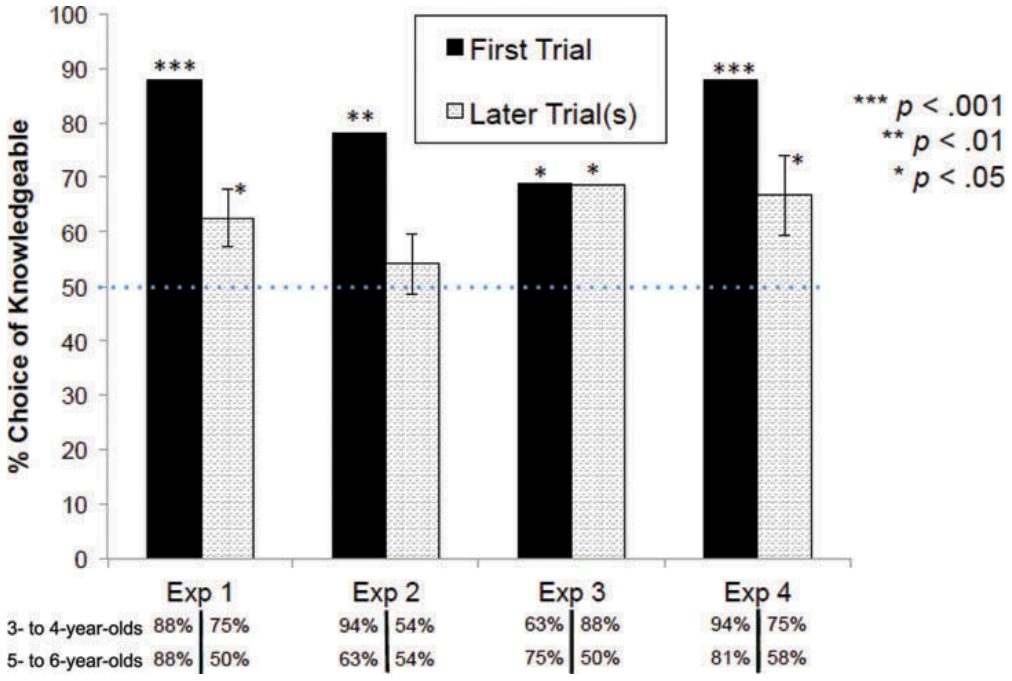


FIGURE 2 Actions to inform the previously knowledgeable actor, Experiments 1 through 4. Asterisks indicate bars that are significantly different from chance (50%) according to binomial tests (Trial 1) and *t* tests (Trials 2–4) in Experiments 1, 2, and 4. In Experiment 3, asterisks indicate bars that are significantly different from chance (50%) according to binomial tests in Trials 1 and 2.

$M = 0.78$, $t(15) = 3.92$, $p = .001$, $d = 0.98$; older, $M = 0.59$, $t(15) = 2.09$, $p = .05$, $d = 0.52$. The majority (88%) of children in both age groups selected the previously knowledgeable actor in their first trial (14 out of 16 for both younger and older groups, both $ps = .004$, binomial tests). On Trials 2 through 4, younger children continued to select the previously knowledgeable actor more frequently than the previously ignorant actor ($M = 0.75$), $t(15) = 3.0$, $p = .009$, $d = 0.75$, whereas older children showed no reliable preference ($M = 0.50$), $t(15) = 0$, $p = 1$. Overall, children reliably chose to inform the actor they had predicted would know the label: younger, $M = 0.83$, $t(15) = 5.17$, $p < .001$, $d = 1.29$; older, $M = 0.70$, $t(15) = 2.48$, $p = .03$, $d = 0.62$.

### Discussion

When children had a new piece of information, they provided that information to the person who had been better informed in the past. Notably, there was no evidence that children preferred to inform the person who had known less in the past: They did not reliably act to help the less knowledgeable actor. Older children's tendency to provide information to the previously knowledgeable person was robust on the first test trial and then was attenuated in subsequent trials. Because both people expressed ignorance about the objects' identities during the phase, the relative knowledge difference between the two actors decreased as test trials continued; older children may have been more sensitive to changing levels of knowledge displayed by the actors. However, across all test trials, both younger and older children consistently elected to teach the person they had thought would know about the object in question.

Presenting videos on a computer in Experiment 1 allowed for a high degree of control over the actors and events. Yet providing information to strangers on a computer screen is quite different from the kinds of situations children experience in the real world. In Experiment 2, we sought to replicate the principal findings from Experiment 1 in a more naturalistic context: Participants watched live events and offered information to actors in person.

## EXPERIMENT 2

### Method

Experiment 2 adapted the method of Experiment 1 to probe children's teaching behavior using live actors. Experiment 2 was modeled as closely as possible on Experiment 1, with exceptions as follows.

The participants were sixteen 3- to 4-year-old children (8 girls, 8 boys; $M_{age}$ = 4;2; range = 3;2–4;11) and sixteen 5- to 6-year-old children (9 girls, 7 boys; $M_{age}$ = 5;11; range = 5;2–6;10). Responses from 7 additional children were excluded from the analyses reported here: Three children participated in the experiment but failed the manipulation check, 1 child failed to complete the experiment, and the remaining 3 children were excluded due to experimenter error.

The experiment took place in a large lab room designed to look like an office with two workstations; this was the same room and same setup that was featured in the videos used in Experiment 1. As in Experiment 1, two female actors sat at workstations facing slightly away from one another. The child spent most of the experiment seated in a chair approximately 6 m

from the workstations, directly facing the tube that led to Sally's office, with full visual access to both actors. The experimenter sat next to the child.

Throughout the experiment, the experimenter and the actors communicated with Sally by pressing a large, white, circular button sitting in between the actors' desks and talking in the direction of the button; Sally's dialogue (which consisted of the same recordings used in Experiment 1) came from a small speaker near the white button and was controlled by the experimenter using a hidden remote. Experiment 2 included one warm-up trial, inserted between the introduction and the first trial of the establishment phase, which served to demonstrate and clarify the mechanics of the task: Sally called the office, the experimenter answered, Sally requested a crayon, and the experimenter encouraged the child to put the crayon in the tube to send it to Sally; when the experimenter called Sally back, Sally confirmed that she had received the crayon. Unlike Experiment 1, in which the experimenter answered the calls and then conveyed Sally's requests to the actors during the establishment phase, in Experiment 2, the actors communicated directly with Sally and answered her calls immediately. During the test phase, the experimenter answered Sally's calls (as in Experiment 1), and the child informed one of the actors by approaching her desk and holding up the card featuring the picture of the unfamiliar object while the experimenter remained seated at her chair.



## Results

Children's responses were scored as in Experiment 1. Children failed to select one actor as more likely to know on 4% of all trials; only one child failed to select an actor on the first of these "predicting knowledge" questions. All participants chose to give information to one (and only one) of the actors on each of the four trials.

### *Predicting Knowledge*

When asked to predict who would know the referents for the novel labels presented in Experiment 2, children tended to select the previously knowledgeable actor ($M = 0.78$), $t(31) = 5.94$, $p < .001$, $d = 1.05$. Younger and older children showed similar responses ($M$ scores = 0.77 and 0.80, respectively). Thus, children generalized their learning about the actors from the establishment phase to the test phase. The majority of children predicted that the previously knowledgeable actor would know the object's identity on Trial 1 ($N = 27$ out of 31 children; $p = .002$, binomial test), as well as on later trials ($M$ score for Trials 2–4 = 0.76), $t(31) = 5.19$, $p < .001$, $d = 0.92$.

### *Giving Information*

When they had the opportunity to provide information to one of the actors in the test phase, children tended to select the previously knowledgeable actor as the recipient ($M = 0.60$), $t(31) = 2.08$, $p = .046$, $d = 0.37$. The scores of younger and older children did not differ from one another (younger, $M = 0.64$; older, $M = 0.56$), $t(30) = 0.80$, $p = .43$. On the first test trial, 25 out of 32 children (78%) gave information to the previously knowledgeable actor ($p = .002$, binomial test). On Trials 2 through 4, children did not reliably select either actor ($M$ score =

0.54), $t(31) = 0.75$, $p = .46$ (see Figure 2). However, on these later trials, children did continue to inform the actor whom they had predicted would know the referent on that particular trial ($M$ proportion informing actor predicted to know = 0.64), $t(31) = 2.68$, $p = .01$, $d = 0.47$.

## Discussion

Experiment 2 generally replicated the results of Experiment 1: Children chose to provide information to a previously knowledgeable person. As in Experiment 1, children's tendency to inform the knowledgeable person was most reliable on Trial 1. In fact, children did not reliably choose the more knowledgeable person on Trials 2 through 4. As in Experiment 1, this decay may reflect the fact that the relative knowledge difference between actors shrank with each testing trial (because both actors were "ignorant" during the test phase). The change to a live presentation format may have made children (especially younger children) more attentive to the changing levels of knowledge displayed by the actors relative to the video paradigm in Experiment 1, in which only older children displayed this pattern of results. Note that although the preference for the knowledgeable actor was somewhat attenuated in Experiment 2 as compared with Experiment 1 (see Figure 2), it did not reverse. Across both experiments and both age groups, there was no evidence of a preference to inform the previously ignorant actor.

Children's behavior in Experiments 1 and 2 is consistent with a general tendency on the part of young children to selectively inform more knowledgeable people. However, children's behavior in this task may also have emerged from a desire to complete the task of helping Sally in an efficient manner, rather than a desire to inform one person over the other. The setup of Experiments 1 and 2 emphasized helping Sally get the things she needed for her work, thus highlighting each actor as either effective or ineffective in achieving that goal. The procedure may have focused children's attention not on the actors' knowledge versus ignorance per se but rather on the actors' role in sending the correct objects to Sally; with these contrasting roles in mind, children may have reasoned that the person who had succeeded in the past would be mostly likely to succeed at sending Sally the correct object in the future. Accordingly, in Experiment 3, we worked to reduce the salience of efficiency considerations by emphasizing the consequences of knowledge versus ignorance for the actors themselves rather than for a third party. To do this, we presented the actors as players in an object-finding game; the knowledgeable actor won the game twice, while the ignorant actor lost the game twice. In Experiment 3, we resumed using a video presentation method to maintain a high degree of control of actors' responses.

Experiment 3 also included a new measure of informing: Participants were asked which player another person—namely, the parent who had brought them to the lab—would choose to teach. The goal of this "other teaching" measure was to determine whether children held a more general belief about which person was the more appropriate target of teaching, when specific aspects of the child's role in the scenario (e.g., concerns about his or her own teaching abilities, his or her idiosyncratic evaluations of the actors) were not relevant to his or her response.

## EXPERIMENT 3

### Method

In Experiment 3, we reframed the activities presented in the previous experiments as a game in which players were evaluated as being correct or incorrect in their selection of objects. Experiment 3 proceeded in a manner similar to that of Experiment 1, with exceptions as follows.

A new group of 16 younger children (8 girls, 8 boys; $M_{age}$ = 4;2; range = 3;5–4;11) and 16 older children (8 girls, 8 boys; $M_{age}$ = 6;0; range = 5;1–6;11) participated. Three additional children were excluded due to experimenter error, and 3 additional children were excluded because they did not complete the experiment.

At the beginning of the session, the experimenter introduced the actors as two players in a game show where the goal was to find various objects. Throughout the experiment, a game announcer narrated the game and interacted with the actors. This (male) announcer could be heard but not seen by the children. The establishment phase proceeded as in the previous experiments, with the exception that the announcer framed each trial by saying, "Our [first/next] question is to find a [ladle]" and directed the question to the actor whose turn it was. The experimenter indicated to the child which actor would receive the question by saying, "Now it's her turn." The knowledgeable and ignorant actors' scripts during this phase were similar to those in the previous experiments, with the omission of any reference to Sally. Instead, when an object was placed in the tube, one of two sounds played: A "ding" indicated a correct answer (accompanied by a yellow star temporarily appearing on the screen), and a buzzer sound indicated an incorrect answer (accompanied by a red "X" temporarily appearing on the screen). In addition, the announcer confirmed whether the answer was correct or incorrect by saying either, "That is correct. That is a [ladle]," or, "That is not correct. That is not a [ladle]." After the four establishment trials, the experimenter conducted the standard manipulation check described in Experiment 1; all children in Experiment 3 correctly identified which player had answered correctly during the establishment phase.

At the beginning of each test trial, the experimenter asked the child to predict which player would know the identity of the unfamiliar object (e.g., "I bet the next question is to find a fep. Who do you think knows what a fep is?"). Then, the announcer explained that the question was for both of the players and then asked the players to find an unfamiliar object. As in Experiments 1 and 2, both players searched for the object and expressed ignorance about the identity of the object when asked by the experimenter. At this point, the experimenter presented the child with a test question. When the player of the child's choice put the object down the tube, the corresponding "correct" sound played, the yellow star appeared, and the announcer said, "That is correct. That is a [fep]."

Unlike the previous experiments, Experiment 3 included only two test trials, and children were asked a different question at the end of each trial. In the first test trial, children were asked to inform one of the players; this paralleled Experiments 1 and 2. In the second test trial, to examine how children expect *others* to inform, children were asked to predict which player their parent would inform.

## Results

### *Predicting Knowledge*

Children expected the knowledgeable actor to know the novel label on the first test trial ($N$ = 24 of 31 children who responded, $p$ = .003, binomial test), but they were less confident about the second test trial ($N$ = 18 of 28 children who responded, $p$ = .19, binomial test). Younger and older children did not differ in their rates of predicting who would know on either the first trial ($N$ = 12 out of 15 responding and $N$ = 12 out of 16 responding, respectively; $p$ = .46, Fisher's exact test) or the second trial ($N$ = 10 out of 16 responding and $N$ = 8 out of 12 responding, respectively; $p$ = 1, Fisher's exact test).

### *Giving Information*

Children chose to provide information to the previously knowledgeable actor rather than the previously ignorant actor ($N$ = 22 out of 32, $p$ = .05, binomial test). Younger and older children did not differ in their tendency to select the knowledgeable actor as the target of their informing ($N$ = 10 out of 16 responding, and $N$ = 12 out of 16 responding, respectively; $p$ = .70, Fisher's exact test). When asked to predict whom their parents would inform, children tended again to choose the previously knowledgeable actor ($N$ = 22 out of 32, $p$ = .05, binomial test). Compared with older children, younger children were somewhat more likely to predict that their parent would choose the knowledgeable actor (younger, $N$ = 14 out of 16; older, $N$ = 8 out of 16; $p$ = .054, Fisher's exact test). In fact, younger children reliably expected their parent to inform the knowledgeable actor ($p$ < .01, binomial test), while older children showed no consistent expectations as a group ($p$ = 1, binomial test).

Children were significantly more likely to inform the actor they had predicted would know the object's identity ($N$ = 23 out of 31 concordant responses, $p$ = .011, binomial test). Children also expected that their parent would inform the person that they (the child) had expected to know the label ($N$ = 22 out of 28 concordant responses, $p$ = .004, binomial test). Younger and older children differed neither in their own tendencies to inform the person expected to know (younger, $N$ = 13 out of 15; older, $N$ = 10 out of 16; $p$ = .22, Fisher's exact test), nor in their expectations that their parents would do the same (younger, $N$ = 12 out of 16; older, $N$ = 10 out of 12; $p$ = .67, Fisher's exact test).

## Discussion

The results of Experiment 3 are generally consistent with findings from Experiments 1 and 2. Participants in Experiment 3 tended to provide new information to the person who had displayed more knowledge in the past. Even though Experiment 3 depicted a game context in which there was no third party who needed help—and therefore no need to consider efficiency with regard to some goal—children chose to provide information to the person who was generally more knowledgeable. There is no evidence that children acted to help the losing player by giving her a piece of new information.

Experiment 3 also included a measure of children's expectations about how other people (their parents) would direct their informing. Children generally expected their parents to show

the same informing behavior and preferred to provide information to the knowledgeable person over the ignorant person. There was a marginally significant age difference, with younger children showing a somewhat stronger intuition that their parents would inform the previously knowledgeable person; conversely, even older children demonstrated no reliable expectation that their parents would choose to provide information to the previously ignorant person. Taken together, the findings suggest that children view people who are generally more knowledgeable as the more appropriate targets of teaching. The fact that children extended the choice to inform the previously knowledgeable person to a third-party adult (their parents) makes it unlikely that this pattern of response is fully accounted for by children's concerns about their own abilities to communicate effectively or any other factors that would apply only to the child.

The method of Experiment 3 does not rule out the possibility that children believed the less knowledgeable person was simply unteachable; perhaps children felt that anyone who displayed such ignorance was just unable to learn new words. Although this alternative is possible, several factors argue against it. First, the items and words used in the familiarization phase were chosen to be fairly unusual. Our pretesting suggested that most children did not know most of the words, and although children may have higher expectations of the size of the adult actors' vocabularies, a target's ignorance of the familiarization words should not have been shocking. Moreover, previous studies that have used a "failed labeling" manipulation have shown that children do not completely lose faith in an informant who has failed to correctly label such familiar items as keys or cups (see Palmquist & Jaswal, 2012). Likewise, children learn from a person whose previous inaccurate information is due to a reasonable circumstance (Nurmsoo & Robinson, 2009). Additionally, young children often display a positivity bias and are more likely to generalize about others from evidence of past successes than from past failures (Boseovski, 2010; Boseovski, Shallwani, & Lee, 2009). Children in the current studies may have viewed the more successful person as more intelligent, but this finding need not imply that the other person was very unintelligent. Finally, there is some evidence that young children see effort as central to intelligence (Heyman, Gee, & Giles, 2003). As both people in the experiments were actively trying to get the right answer, both were displaying some intelligence. At a minimum, both potential targets were interested and engaged in the task (trying to help Sally in Experiments 1 and 2, trying to answer the questions in Experiment 3) and gave children good reason to expect that both would want to learn the new information.

Experiments 1 through 3 all featured a history of knowledge or ignorance on the part of the actors (during the establishment phase), followed by equal ignorance (in the test phase). These studies therefore addressed the role of general knowledge in children's selective informing; critically, neither potential informant already possessed the specific information the child had to share. In Experiment 4, we asked whether children would inform the knowledgeable person even when the information would not be useful to the knowledgeable person because she already knew the specific information children had to offer. This situation provides a particularly strong test of children's documented preference for interacting with previously knowledgeable others. Presumably, the lack of utility of the new information for the previously (and now currently) knowledgeable person provides some reason to inform the ignorant person instead.

## EXPERIMENT 4

In Experiment 4, we presented participants with the same establishment phase as in Experiment 1 but changed the events in the test phase so that the actor who was knowledgeable about object identities during the establishment phase was also knowledgeable about object identities during the test phase. Thus, participants in Experiment 4 were asked to choose between sharing information with a person who already knew that information (i.e., the knowledgeable actor) versus a person who did not know the information (i.e., the ignorant actor).

In addition to testing the robustness of children's tendency to choose knowledgeable people as targets for informing, the findings from Experiment 4 should shed light on alternative explanations for children's choices in Experiments 1 through 3. If children in previous experiments informed the knowledgeable person because they wanted to reward the knowledgeable person's behavior during the establishment phase, then they might not reliably inform the knowledgeable person in Experiment 4, as telling a person something she already knows is not a particularly meaningful reward. If, however, children inform knowledgeable people out of a general preference or desire to affiliate with them, then participants in Experiment 4 should continue to select the knowledgeable person in the test phase.



### Method

Experiment 4 was similar to Experiment 1, with the following exceptions: The participants were a new group of sixteen 3- to 4-year-old children (8 girls, 8 boys; $M_{age}$ = 3;11; range = 3;2–4;8) and sixteen 5- to 6-year-old children (8 girls, 8 boys; $M_{age}$ = 6;0; range = 5;1–6;10). One additional child participated in the experiment but failed the manipulation check.

When the experimenter asked the actors whether they knew what an object was called on each trial during the test phase, the previously knowledgeable person nodded (and the previously ignorant person shook her head). The videos then froze and the experimenter then said, "So it looks like this person does/doesn't know what a [toma] is, and this person does/doesn't know what a [toma] is." An opaque screen occluded the actors while the experimenter showed participants the object in the picture dictionary. Following this, the screen was removed and the experimenter reminded participants which person knew what the object was and which person did not. As in the previous experiments, the experimenter then asked participants whom they wanted to tell.

### Results

#### *Predicting Knowledge*

Children predicted that the knowledgeable actor would know the referent during test trials ($M$ = 0.89), $t(31) = 9.00$, $p < .001$, $d = 1.60$. Both younger and older children selected the knowledgeable actor at rates greater than expected by chance: younger, $M$ score = 0.83, $t(15) = 4.61$, $p < .001$, $d = 1.15$; older, $M$ score = 0.95, $t(15) = 9.67$, $p < .001$, $d = 2.41$. The majority of children indicated that the previously knowledgeable actor would know the object's identity on

Trial 1 ($N = 28$ out of 32 children, $p < .001$, binomial test), as well as on later trials ($M$ score for Trials 2–4 = 0.90), $t(31) = 8.61$, $p < .0001$, $d = 1.53$.

### *Giving Information*

Overall, children chose to give information to the knowledgeable actor ($M = 0.72$), $t(31) = 3.57$, $p = .001$, $d = 0.63$. There was no significant age difference (younger, $M = 0.80$, older, $M = 0.64$), $t(30) = 1.29$, $p = .21$. On the first trial, the majority (88%) of children selected the knowledgeable actor (15 out of 16 younger children; 13 out of 16 older children; both $ps < .05$, binomial tests). On Trials 2 through 4, children continued to select the knowledgeable actor more frequently than they selected the ignorant actor ($M = 0.67$), $t(31) = 2.27$, $p = .03$, $d = 0.40$. Again, there was no significant age difference, $t(30) = 1.14$, $p = .26$. Overall, children reliably chose to inform the actor they had predicted would know the label ($M = 0.70$), $t(31) = 3.04$, $p = .005$, $d = 0.54$.

## Discussion

Participants in Experiment 4 chose to provide information to the knowledgeable person rather than the ignorant person during the test phase even though the former person stated she already knew what the objects were. This finding underscores the robustness of children's bias to inform those who are knowledgeable. Further, the result casts some doubt on the hypothesis that children in Experiments 1 through 3 provided information to the knowledgeable person as a reward: The knowledgeable person in Experiment 4 did not need the information on offer, so it would be odd for children to provide the information as a reward. In contrast, participants' behavior in Experiment 4 makes more sense if they saw the provision of information in the present experiments as an opportunity to affiliate with the knowledgeable person.

The findings from Experiment 4 also address a potential concern about children's choices in Experiments 1 through 3. In all of the experiments, we asked participants to predict who would know the referent for the label before asking them whom they wanted to tell. One possibility is that children simply informed the person to whom they had previously pointed (on the knowledge prediction question) because that person was more salient. In previous experiments, children's tendency to choose the knowledgeable person was attenuated across the four trials for both the prediction question and the informing question. However, in Experiment 4, participants' tendency to choose the knowledgeable person as the person they expected to know the referent was robust in later trials (the mean score for "predicting knowledge" in Trials 2–4 was .90); this finding makes a good deal of sense given that the knowledgeable person remained knowledgeable throughout the test phase. In contrast, children's tendency to select the knowledgeable person as the target for information sharing was attenuated across trials in Experiment 4, just as it was in previous experiments (see Figure 2). Therefore, children did not always answer the question, "Who do you want to tell?" in the same way as they answered the question, "Who do you think knows?" This partial dissociation provides some evidence that children were not simply repeating their responses.

## GENERAL DISCUSSION

### Summary

In Experiments 1 through 3, children tended to provide information to someone who had displayed greater knowledge in the past. Moreover, they never showed a tendency to provide information to a person who had been ignorant in the past. The preference to inform knowledgeable others held across changes in presentations (video vs. live) and task structure (helping a third party vs. winning a game) and was even obtained when the knowledgeable person stated that she already had the information the child could offer (Experiment 4).

In most cases, younger and older children showed similar responses in the present research. Of course, the general lack of age effects in the data does not mean that older and younger children evaluate potential recipients of information in the same ways. It is possible that our methods were not sensitive enough to detect age differences reliably or that different mechanisms underlie the choices of younger and older children. Indeed, there was a significant age difference in Experiment 1: Younger children tended to consistently choose the knowledgeable actor across four trials, whereas older children tended to choose randomly in later trials. We suspect that the attenuation of older children's preference for teaching the knowledgeable person, in part, reflects superior abilities integrating new information with old information. Older children may have been better able to adjust their teaching as knowledge differences between potential recipients shrunk from earlier to later trials. We also suspect that older children may consider a wider range of factors when choosing with whom to share information. For example, the attenuation of the knowledgeable preference could reflect consideration of fairness and balance as older children distributed their information sharing across recipients.

The results of the present experiments dovetail with findings from previous research on children's selective learning. Numerous studies provide evidence that young children are selective when receiving and seeking information from other people and that they favor those who have demonstrated greater knowledge in the past (e.g., Birch et al., 2008; Corriveau & Harris, 2009; Koenig & Harris, 2005). The findings from Experiments 1 through 4 indicate that young children are also selective in their provision of information to others and favor those who are knowledgeable over those who are ignorant.

### Understanding Children's Choices

Exactly why children chose to inform knowledgeable rather than ignorant individuals in the present experiments remains somewhat unclear. The results of Experiment 3 cast doubt on one hypothesis—namely, that children inform more knowledgeable people because they want to efficiently complete a given task. In Experiment 3, children informed the previously knowledgeable person when there was no instrumental goal.

Another explanation for the results is that children informed the previously knowledgeable person (and indicated that their parents would do so as well) because they thought she was more deserving of reward. Children may interpret displays of knowledge as indicative of merit and may use informing as a way to reward more deserving recipients. We think this explanation is unlikely given that in Experiment 4, children reliably informed the actor who already knew, an act that would provide no benefit to the recipient. Nevertheless, future research might provide

participants with detailed information about how a knowledgeable person came to be informationally rich (e.g., studied hard in school vs. stole the office picture dictionary at the start of the work day) to understand the role of children's concerns about merit when providing information to others.

A remaining possible explanation for children's choices across the four experiments is that children selected the more knowledgeable person out of a desire to affiliate with her—either because they simply liked her and wanted to interact with her or because they thought giving would engender future interactions in which they might learn something valuable from the more knowledgeable person as a form of reciprocity. Future research might manipulate the attractiveness of potential teaching targets independent of their knowledge status. For example, would children prefer to inform a mean person who demonstrated great knowledge over a nice person who demonstrated ignorance?

## Connecting to Other Literatures

While there remain several plausible explanations for children's tendency to inform knowledgeable people, the fact that they showed this tendency, for whatever reason, is somewhat surprising. First, our results—in particular those from Experiment 4—appear to conflict with findings from previous studies of children's selective informing decisions: As reviewed in the Introduction, children will chose to provide information to a person who lacks specific knowledge rather than to someone who possesses it (e.g., Liskowski et al., 2008; Shwe & Markman, 1997; Shatz & Gelman, 1973). In contrast, we found that children preferred to inform the person who already knew the specific information in Experiment 4. Perhaps children use two principles to guide their decisions about whom to inform: "Inform people who generally know more" and "Inform people who do not already know the specific fact." Experiments 1 through 3 address the first principle, and most work in selective informing has addressed the second principle. Experiment 4 suggests that when those two principles identify competing informants, children rely on the general rather than specific principle.

A recent study (Cluver, Heyman, & Carver, 2013) also combined past history of general knowledge with lack of specific knowledge. In this case, children did prefer to provide information to a person who both generally and specifically knew less, in seeming contrast to the results of Experiment 4. One difference is that Cluver and colleagues' (2013) study also provided affect information: The more knowledgeable person was a lively and engaged social partner, while the person who knew less displayed flat affect and did not engage in eye contact. Perhaps the ignorant person therefore appeared to be upset by her lack of success. In contrast, in our experiments, the ignorant actor expressed no negative affect. Likely there are many principles or considerations that children may use when deciding whom to inform. It remains for future research to identify these various principles and how they may interact in specific contexts.

Our findings could also be viewed as inconsistent with previous research on children's behavior when distributing material resources among third parties: Preschool- and elementary school-age children often prefer to distribute material resources equally among third parties when possible (Kenward & Dahl, 2011; Olson & Spelke, 2008; Shaw & Olson, 2012) and sometimes ignore potentially relevant variables, such as an individual's effort (e.g., Anderson & Butzin, 1978; Enright et al., 1984; Nelson & Dweck, 1977; Sigelman & Waitzman, 1991). Most

relevant to the present research, 4- to 6-year-old children will sometimes work to rectify preexisting unequal distribution of resource materials by giving more to those who have less over those who have more (e.g., a "poor" vs. a "rich" child; Zinser, Perry, & Edgar, 1975).

One might frame the present experiments as giving children an opportunity to distribute information rather than material resources. In contrast to the work on material resources reviewed earlier, children in our experiments neither distributed knowledge to each person equally (by ignoring the characters' previous performances) nor did they act to produce more equitable distributions of knowledge (by sharing information with the ignorant person during the test phase). Instead, children responded in a way that seemingly consolidated the established knowledge difference (by sharing information with the knowledgeable person during the test phase).

Of course, material goods and information differ in important ways. Notably, while in most cases the supply of a material resource is depleted as the resource is distributed, information can be shared with multiple people and without being diminished. Choosing to give a cookie to one person necessarily means not giving it to another, but one piece of information (e.g., the recipe for Grandma's cookies) can easily be shared with multiple people. This property of informational resources may prove useful in disambiguating some of the explanations for children's behaviors in our studies. If children's information sharing is guided by their overall positive reaction to those who have greater knowledge, then they might choose to inform the knowledgeable person first but would not necessarily refuse to inform the less knowledgeable person. On the other hand, if children provide information because they intend to reward a deserving party, then it is critical that nondeserving parties be denied access. If given the opportunity to publicly broadcast a novel piece of information or to privately communicate it, children might not share it with everyone; they may be particularly selective of the deserving party.

The key finding from the present article—that children give more to those who have more rather than to those who have less—is not entirely unknown. Recent research in the domain of material resource distribution has shown that young children sometimes perpetuate preexisting inequality by giving more to those who already have more (Olson, Dweck, Spelke & Banaji, 2011). Such a pattern is consistent with "system justification" (Jost & Banaji, 1994) in which people reason that existing patterns of inequality must be justified and so act to continue the status quo. One could interpret children's behavior in the present experiments as system-justifying behavior in response to an established pattern of informational inequality.

## Concluding Remarks

Children are neither egalitarian information consumers nor egalitarian providers: They preferentially learn from, and provide information to, those who demonstrate knowledge. In making sense of this finding, it is important to note that although our experimental tasks limited children to a single informing interaction with a partner, social exchanges in natural environments tend to be repeated: Informing is generally a two-way street, an exchange rather than a simple transfer. Thus, in choosing a target to provide information to, one is typically also choosing the same target to receive information from. Under this conception, it makes a good deal of sense for children to be judicious in how they go about sharing their gifts of knowledge, as they seek to establish productive, collaborative relationships with others in their culture. Although it might be

nice to share information with those in most need, it might be prudent to share information with those who can most effectively share information themselves.

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